National Institutes of Health (U.S.) Office of the Director

DR. ROBERT Q. MARSTON'S

SPEECHES AND ARTICLES

Volume I

DR. ROBERT Q. MARSTON'S
SPEECHES AND ARTICLES

VOL. I

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TAB 1

BEFORE DIRECTORSHIP

ings of others,[2-4] are compatible with Dahl's hypothesis.

We are indebted to the Cook Island Medical Service for considerable help and to the participants in the surveys.

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SPECIAL ARTICLE

TO MEET THE NATION'S HEALTH NEEDS*

Robert Q. Marston, M.D.

IT is a high honor and privilege to deliver a lecture bearing the name of one of those remarkable families of New England – families that have helped to shape the destiny of this state, this region and the nation as a whole. Dr. Joseph Garland, in his lecture to this Society a few years ago, traced this distinguished dynasty through four generations, from Dr. George Cheyne Shattuck 1st, whose bequest endowing this lectureship was among his many outstanding legacies to medicine in Massachusetts, through his grandson, Dr. George Brune Shattuck, who appropriately delivered the first lecture in 1890, to Dr. George Cheever Shattuck, a widely known leader in public health and tropical medicine. It was a cousin, Lemuel Shattuck, who founded the American Statistical Society and issued, in 1850, a classic report on "A General Plan for the Promotion of Public and Personal Health," which helped lay the foundation for the public health movement in this country.

I suspect that any member of the Shattuck clan would have had less difficulty than I in gathering his thoughts about the future of our profession. Each has had vision far in advance of his time. And each in his own time has demonstrated, by the diversity of his public interests, the essential link between medicine and the broader currents of society that I shall touch upon today.

The choice of a subject for the Shattuck Lecture before this distinguished Society should at the very least focus on major health problems of the times and also represent an area of special interest, thought and concern for the speaker. At first, when I considered the subject, "To Meet the Nation's Health Needs," it seemed somewhat presumptuous. In reviewing the list of previous speakers, however, I found that in 1964, Joseph Garland spoke to you on the very broad subject of "The Proper Study of Mankind." A selection from the 1950's shows that Leland McKittrick spoke on "The Patient." The very first lecture, by Dr. George Brune Shattuck in 1890, discussed the broad subject of "Influenza in Massachusetts"; and two years later Dr. James Adams discussed the still more general topic of "The Prevention of Disease in Massachusetts." Indeed, as I look over the list of previous speakers and their topics – whether it is Osler on "Tuberculous Pleurisy," Cushing on "Diabetes Insipidus," Joslin on "Diabetes Mellitus," Zinsser on "Immunology," Penfield on "Epilepsy," Fleming on "Antibiotics" or Ebert, year before last, on the "Government and the Private Sector" – it is clear that each was talking in his own terms about meeting the nation's health needs.

In 1968 there is, I believe, a specific factor that justifies such a title as the one I have chosen. This factor is the possibility or threat, depending on how one looks at it, that the nation's health needs will be viewed in a more highly organized fashion, and under conditions more likely to lead to actual changes, than has been true in the past. These opportunities or threats are not the product of any one mind or discipline. They do not grow out of the deliberations of any single component of the medical professions alone, or from any segment of society alone, or from the federal Government alone.

*The Shattuck Lecture presented at the annual meeting of the Massachusetts Medical Society, Boston, May 22, 1968 (address reprint requests to Dr. Marston at National Institutes of Health, Bethesda, Md. 20014).

This new view of health need is closely tied to much broader and more powerful trends and forces than those contained within the field of medicine. Furthermore, the reactions to such pressures to meet the nation's health needs will come from many sources, both within and outside the health professions, both within and outside the various arms of government — state and local as well as federal. Already these pressures are generating a strong motivation for changes — in medical education and biomedical research, in the organization and delivery of health services and in the prevention of disease and control of the environment.

Ours is a nation in the process of accommodation to swift and searching tides of change in all areas of human concern. The expressions of this accommodation are clearly and harshly audible across the whole range of our society. We hear them as overtones in this unusual election year; we hear them in the waves of protest and counterprotest in cities and towns and college campuses. If we listen carefully we can also hear expressions of this accommodation, less noisy but perhaps more significant for the future, in the changing of gears and changing of minds as society begins to respond to these new pressures. Our society is undertaking a serious reexamination of itself and of the way it governs itself and of the way it makes decisions.

Over the years and over the centuries, we in the health world have enjoyed relative immunity from the political and social currents swirling around us. Health and medicine in a sense have been considered above the battle — important to society but somewhat removed from its turbulence. Statesmen have spoken kindly and rather vaguely about health, and our own medical statesmen, with a few notable exceptions, have tended to speak with equal kindness and vagueness about society as a whole.

Now, however, it is very plain that this immunity, this divorcement, is a thing of the past. Whether we like it or not we are involved to the hilt in the social dynamics of our time, and we are sharing fully in the pressures driving toward accommodation. One of your New England medical statesmen, David D. Rutstein, writes of the "Coming Revolution in Medicine," a phrase that no one would have uttered above a whisper a few years ago. A brilliant Negro physician, Dr. Alvin F. Poussaint, delivers a lecture to a medical audience on "The Dynamics of Racial Conflict." A New England Senator, Edward M. Kennedy, surveys and summarizes in a broad sweep the entire range of the health field and moves toward the development of specific proposals for the consideration of the Congress. Another New England Senator, Abraham Ribicoff, conducts hearings that pose probing questions and will require searching answers on why things are as they are in medical care and how they can be improved.

These four contemporary events, all of them proceeding from a New England base, are significant in themselves and even more significant as illustrations of what is happening across the country and throughout our national and medical cultures. Health and medical care are hot topics — not the cool subjects for reflection that we have known them to be. They are political topics. They are stage front, under the bright lights of national attention. This is a strange and unaccustomed and in some ways unfortunate place for a group of physicians and scientists like us to find ourselves, but that is where we are.

The forces that combined to put us there have been described at great length by many. Essentially they are twofold. The first is the force of the scientific revolution in medicine, which, thanks to an unprecedented national commitment to biomedical science, has spectacularly increased our medical capability in the last few years and will continue to do so at an accelerating rate far into the future. The second is the force of the social revolution with respect to health as an attainable condition of man.

Until very recently the very best of health care for all was viewed as an unrealistic goal for this nation. Other nations, particularly the socialized ones, have talked about equal care for all, and we ourselves have been more than willing to accept a minimal level of care for all. Today, there is a national commitment, with very broad support, that views the best of good health and excellence in health care as an emerging right to which all can aspire.

We physicians tend to have trouble with this widespread public clamor about the best medical care for all. On the one hand, many of us believe it implies undue criticism of the medical profession itself, because each of us as an individual has accepted the best in care as a personal mandate throughout his career. Secondly, we see it as a promise that cannot be fulfilled, not only because of the limitations of resources and mechanisms but also because the consumer himself has a dominant role in defining "the best of medical care" — a role we cannot and perhaps should not control.

Unquestionably, facing squarely the problems of meeting the nation's health needs will require a degree of discomfort. We in the health field will be especially uncomfortable — first of all, because any change might suggest real or imagined deficiencies in the past and, secondly, because whatever we may do in the health field will undoubtedly fall short to some degree of the high goals we seek to reach. Furthermore, our experience in universal delivery of excellence is limited, and our present knowledge and resources are probably inadequate to the task.

For these and other reasons, there is some outright pessimism about our ability to meet the nation's needs in health, as well as in other fields — more, perhaps, than at the depth of the depression or in the midst of either of the major world wars. In part it may be that our social conscience is more

rigorous today than it was in those times. Certainly, the mechanism of demonstrating and dramatizing social needs – methods growing largely out of the civil-rights movement – have become more effective than ever before in the past.

But it is not simply that we are more appalled than ever at Marie Antoinette's outrageous statement of "let them eat cake." We are trying to move beyond the basic necessities for food and shelter and minimal health care into the area of health care as a foundation for self-fulfillment. And this movement raises new problems for us.

How shall we approach these problems? I have no blueprint, nor do I believe that such a blueprint exists. For any blueprint imposed upon this large and complex nation would inevitably fail to meet the differing needs of different parts of the country and would not utilize the unique strengths of each region or locality. Put another way, I do not believe a federal or socialized system of medicine could be constructed, much less implemented, to meet the health needs of this nation. Rather, we are challenged to develop processes that take full advantage of our pluralistic health resources, and we are already seeing evidence of serious attempts in many directions, stemming from many groups, which are perceptibly moving us toward meeting this very serious challenge.

Although I shall direct my discussion primarily to federal activities, it is important to recognize that others could speak equally well about the changes occurring in the voluntary and professional health agencies, in the hospital field, in the business world and at the community, city, state and regional level. Indeed, with so much going on in so many places, the reasonable question may well be asked: What is the federal role in the health field, and what is it likely to be in the future? There are some clear answers in some areas. In others some very important questions have yet to be answered.

In the support of biomedical research, the federal Government has had and will undoubtedly continue to have the dominant role. In medical education the federal role is of recent origin, but because of the serious financial plight of educational institutions in the health field federal support in this area will undoubtedly grow in the future. Still more recently it has been decided, after years of discussion, that there is a federal role related to the purchase of health services for the aged and, jointly with the states, for the indigent. In each of these instances the nature of the federal role is clear – support of individual and institutional initiative in science and education, and a guarantee of payment for services rendered to selected groups in need.

In relation to the organization and delivery of care, however, we are definitely in the experimental phase. This experimental movement is represented by PL 89-239, the Regional Medical Programs for Heart Disease, Cancer and Stroke; PL 89-749, the Comprehensive Health Planning Act (the "Partnership for Health," as it is also called); and the National Center for Health Services Research and Development, established just this past month. These programs are closely related. Yet the reasons for their emergence were quite different.

For instance, the National Center for Health Services Research and Development arose because of the clearly perceived need to bring together within the Department of Health, Education, and Welfare the various activities involved with research and development in the health-service field and to expand these efforts in a systematic search for new knowledge. It is a development comparable in some ways to the establishment of the National Institutes of Health, some years ago, for the parallel purpose of stimulating and supporting research in biomedical science.

The Partnership for Health program, the second youngest of the group, emerged in response to two serious needs. One of these was the necessity for support of comprehensive health planning at the state and local level, including activities usually considered outside the health field but closely related to health programs. The second was the need for increased flexibility in the joint funding of state activities so that resources could be effectively targeted on priority needs. This latter purpose has been accomplished by decategorizing both the formula and the special-project portions of such support.

The Regional Medical Programs for Heart Disease, Cancer and Stroke grew from a concern with the relation of scientific advance to the actual delivery of health services. It stemmed from a sense of need to stimulate regionalization so that the best of health care could be made available through the sharing of scarce resources and the extension of the capability of major centers to the community at large.

Each of these three major new endeavors, the Regional Medical Program, the Partnership for Health and the National Center for Health Services Research and Development, is heavily dependent on the use of nongovernmental consultants both for policy determination and for the actual distribution of dollars. Their work is inter-related with agencies outside the federal Government at every level. They represent major new mechanisms by which the Government will work to carry out its responsibilities to help meet the nation's health needs.

Since I have worked for the past two years in Regional Medical Programs let me cite a few examples that illustrate how that effort, in the words of the law, "encourages and assists activities designed at the local level to improve health care in the regions." It has without doubt encouraged a dialogue and the development of co-operative arrangements among existing institutions and organizations.

As examples of the kinds of co-operative relations

that are beginning to emerge, four hospitals in Lafayette, Louisiana, working with the State Heart Association and one of the medical schools, have decided to develop a high-quality coronary-care unit in one of the hospitals, jointly funded and equipped, with staff jointly recruited and trained, as an efficient means of improving the care of patients with myocardial infarction in that area. In Anchorage, Alaska, in response to a need identified by the Washington–Alaska Regional Medical Programs, the community is raising funds for a treatment center to house a high-energy radiation source (previously available only in faraway Seattle), which will be operated as a regional resource by the Providence Hospital of Anchorage. In Nashville, Tennessee, the Vanderbilt and Meharry medical schools are collaborating with a neighborhood health center supported by the Office of Economic Opportunity to provide comprehensive care to disadvantaged families for whom such care was never available before.

Efforts to bridge the gap between science and service are under way in many areas. In Missouri local physicians are testing the usefulness in patient care of computer-assisted and semiautomated interpretation of electrocardiograms, drawing on the expertise and facilities of the University of Missouri and building on previous work carried out by the Public Health Service's National Center for Chronic Disease Control. Five hospitals in Salt Lake City are working together to explore computer application to clinical problems. In Wisconsin the Marshfield Clinic has established referral routes from five hospitals for emergency care of patients suspected of having pulmonary embolism.

Many other examples could be cited — joint projects in education and training, demonstrations of patient care, frankly experimental projects and many more. The important thing is that new patterns of collaboration are evolving, and new combinations of resources are being applied to the delivery of service. The task of Regional Medical Programs is complex, and the effort is very young, but already it is demonstrating a vital and enthusiastic response, by the nation's health resources, to an invitation for innovation.

Although the Partnership for Health legislation is newer still, one can already see the beginnings of similar progress in this program through the establishment of statewide health planning agencies, the strengthening of existing area-wide planning groups and the development of new ones, and the training of health planners. In addition, taking advantage of the new flexibility in formula grants and project grants, states and communities are initiating high-priority activities aimed at meeting their special needs.

The National Center for Health Services Research and Development is too new to claim any results to date. It is clear, however, that two major and overriding problems will be faced by this as well as all federal programs. The first is the problem of how to do better in making care accessible to the disadvantaged. The second is how best to protect all of us from the very rapid rise in health costs.

The current reorganization of the health resources of the Department of Health, Education, and Welfare is a matter of interest to health groups throughout the country. The fact that this reorganization is taking place right now is clear evidence of the strength of the forces for change in health and medicine. In normal times this would be a year in which no major innovations would be anticipated. It is an election year. It is a year in which budgetary conditions are particularly complex as the nation seeks to respond to both foreign and domestic commitments while avoiding serious economic repercussions. Normally, therefore, this would be a time, if not of slowdown, at least of following familiar patterns. Instead, precisely because of the urgency for change, the decision has been made to make fundamental alterations in the federal health establishment.

Under the new structure, the federal role in developing professional health manpower has been linked both organizationally and operationally with the support and conduct of medical research in a new and enlarged National Institutes of Health. The broad range of programs related to the organization and delivery of health services has been pulled together into the Health Services and Mental Health Administration.

In addition to the three new programs previously described, this new administration includes the provision of direct health services to American Indians and Alaska natives through a farflung network of hospitals, clinics and contractual arrangements; provision of care to merchant seamen, and other beneficiary groups through the Public Health Service hospitals; protection against disease through quarantine activities and a variety of eradication and control programs in both the chronic and communicable disease fields; major concern with the complicated problems related to mental health, including research, training, and the stimulation and support of community delivery of services; and maintenance and improvement of the Nation's system of health statistics.

This is a powerful array of forces. Pulling them together in an operational context will bring together around the same conference table, regularly and on a continuing basis, the leadership of programs whose activities are inseparably interlocked as they move in different modalities to attain common goals.

However, this concentration of federal forces, authorities and mechanisms can be truly effective only so far as it assists and stimulates and supports the far more powerful array of forces and talents throughout the nation — the physicians and other health professionals, the providers of services, and ultimately the 200,000,000 people of the country.

For the essence of the federal role in health services is not direction but stimulation. The Government can be a definer of needs, an experimenter, a catalyst, an innovator. Acceptance of the right to health establishes beyond reasonable doubt the existence of governmental responsibility to participate in the process of fulfilling that right. The question among reasonable men is no longer whether there is a federal role in health, but how to define that role and how to translate that definition into action so that the federal resources are applied most effectively in partnership with other resources to meet the nation's health needs.

This job — meeting the nation's health needs — is the task before us. Its scope exceeds the ability of any one element to do it alone. My fear is not federal medicine or socialized medicine, but the fear that we will not get the job done.

Thomas Jefferson, in June, 1776, in drafting the Declaration of Independence, emphasized that he was giving expression to widely held views when he wrote: "We hold these truths to be self-evident. . . ." I hold as self-evident that this Society and the medical profession as a whole are deeply committed to meeting the health needs of the nation and that although we face a time of unparalleled challenge we also face a time of unparalleled opportunity. This, if you will, is a kind of declaration of interdependence.

There are high hopes throughout the world that we in this country can demonstrate the same types of accomplishments in health care that we have demonstrated in other areas, such as biomedical research. These hopes and the expectations of our own society are so high indeed that we must face realistically the possibility that the many challenges may exceed our combined ability to meet all of them as we should like to. There has never been a greater opportunity for all to work together for the achievement of truly important health goals.

MEDICAL PROGRESS

HOST DETERMINANTS OF RESPONSE TO ANTIMICROBIAL AGENTS (Continued)*

Louis Weinstein, Ph.D., M.D., and A. Condon Dalton, M.D.

Genetic Factors

The genetic background of patients may play a determinant part in the use of some antimicrobial agents. Although there may be other examples of this phenomenon, two outstanding ones are deficiency of glucose-6-phosphate dehydrogenase (G-6-PD) and differences in the rate and degree of hepatic acetylation of isoniazid. Both the results of treatment and the risk of reactions are determined, in some cases, by these genetic abnormalities. Failure to recognize their presence may result, on the one hand, in rapidly developing acute hemolytic anemia, and, on the other, in possible undertreatment of tuberculosis or the appearance of serious toxic manifestations.

Inactivation of Isoniazid

The rate at which isonicotinic acid hydrazide (INH) is conjugated and biologically inactivated in the liver by combination with acetyl radical is known to be genetically determined.[68-70] Evans et al.[70] treated 484 subjects with 9.8 mg of the drug per kilogram of body weight. Examination of the serum concentrations six hours later revealed a bimodal distribution. Those with blood levels of less than 2.5 mg per milliliter of active isoniazid at six hours were considered to be *"rapid"* inactivators; those with quantities greater than this were called *"slow"* inactivators. Studies of families revealed that slow acetylation was an autosomal recessive trait, whereas rapid conjugation was a dominant characteristic. A gene "dosage" effect was suggested by the fact that in heterozygous persons, serum concentrations in the range between those of "rapid" and "slow" inactivators developed. The two extremes of rates of inactivation were distributed in about equal frequency. There was no difference in their frequency in Negroes and white persons. Harris and his colleagues[71] found rapid inactivation of the drug more frequently among Japanese than among Americans of diverse European ancestry. Eskimos appear to be predominantly rapid inactivators (95 per cent), in contrast to Canadians and recent immigrants from Europe (44 per cent).[72] Using partially purified preparations of the INH-acetylating enzyme recovered from the livers of "rapid" and "slow" inactivators, Jenne[72a] found them to be qualitatively similar. He related the variation in the rate of conjugation of the drug to differences in the quantity of enzyme present within hepatic tissue.

The significance of rapid inactivation in deter-

*From the Infectious Disease Service of the New England Medical Center Hospitals and the Department of Medicine, Tufts University School of Medicine (address reprint requests to Dr. Weinstein at the New England Medical Center Hospitals, 171 Harrison Ave., Boston, Mass. 02111).

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TAB 2

PRESS BRIEFING - July 18, 1968

Dr. Robert Q. Marston

I find as I look back over the last three or four years that I apparently am having increasing difficulty holding a job. However, looked at another way and more seriously I am humbled by the opportunities that have tumbled upon me during this brief period of time; first, the dean of a medical school, which was not only at the vortex of a major movement in the civil rights area but actually able to respond in a positive fashion towards assuring adequate educational opportunities and health care without regard to race, creed or color.

The second job--to establish a program designed specifically to link science and service research and patient care, education and treatment through the development of the Regional Medical Programs for Heart, Cancer and Stroke.

The key problem in launching that program was to mobilize the existing talent and resources throughout the Nation to work towards the achievement of common goals of improving the quality and availability of health care.

As recently as last Friday, the House of Representatives in floor debate documented evidence across the country of the successful beginning of that program by voting overwhelmingly, 325 to 1, to extend that program. It was with great reluctance that I left the job of Director of Regional Medical Programs to face however with considerable enthusiasm the broader responsibilities of the newly established Health Services and Mental Health Administration in April of this year.

The past three and one-half months represent a unique experience in my life. Within the Administration and outside of the Health Services and Mental Health Administration there has been a sense that we are now in a historic period of development of improvements in the organization and delivery of health care; that this will occur by building on the resources and talent existing throughout the country.

The problems are great because the aspirations of the American people are great and the potential for achieving them exceed any we have experienced previously.

By September 1st, the senior staff of the Health Services and Mental Health Administration, with few exceptions, will be on board. The organizational strategy was displayed to key leaders in the Health Services and Mental Health Administration only a week ago. You will understand, therefore, that my principal concern at this time is that this change in my position will in no way constrain the efforts and work which have been going on, not just for the last three months but in many instances for years by many people.

So you see it is inevitable that I look towards this appointment with somewhat mixed feelings and indeed real reluctance once again to leave an area of activity offering great opportunities and challenges.

Once again, however, this reluctance in no way decreases my sincere appreciation for the confidence expressed by Dr. Lee, Secretary Cohen and President Johnson in selecting me to succeed Dr. Shannon as Director of the National Institutes of Health.

NIH has been part of my life all of my professional life as it has been a part of the life of everyone in academic medicine. The two years I spent as a scientist at NIH in the early fifties and the 2-½ years up until last April when I served as Associate Director and Director of the Regional Medical Programs represent high points in my career, both in terms of opportunity for effective work and for outstanding associations with colleagues.

I have felt it a privilege to work with Dr. Shannon and the immediate staff of the Office of the Director in unusually warm and stimulating environment. During that time I learned much from them--but now I feel not enough--and I can approach this new position only with the sense of awe because of the brilliant performance of Dr. Shannon and of his staff during the major period of growth of NIH.

As one looks to the future, one can only do so by recognizing the fact that both the national investment of resources and talent and even more importantly the achievements of the National Institutes of Health has changed and will change. They will change from both decisions and actions will arise in the future. The ultimate constraint on our ability to affect the health of the people is neither dollars nor manpower but the knowledge gained through research.

Furthermore, before the responsibilities for education were merged with the responsibilities for biomedical science this spring we had as a Nation decided to blend science and education in our institutions of higher learning. This blending has not yet been consummated at the National level because the shortness of time since the organizational change. However, I

know there has been vigorous staff work by Dr. Shannon's staff to prepare the stage for administrative decisions.

Finally, I know Dr. Shannon would agree that success of NIH in the past has not been dependent only on the activities carried out on the Bethesda campus. The far greater proportion of work, dollar expenditure and achievement has been carried out in the institutions throughout this Nation. A major problem of the future will be how to insure the type of institutional stability during times of manpower and fiscal shortages on which future success is dependent.

TAB 3

DIRECTOR OF NIH

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The Several Paths to Quality

*Robert Q. Marston, M.D.**

THE invitation to present the keynote address at this annual meeting of the Association has brought a deep sense of honor and privilege. In agreeing to speak on the quality of health care, I also felt a measure of confidence; surrounding events, when I accepted, were giving me a strong exposure to the subject. Early this year the Division of Regional Medical Programs held a most successful conference-workshop on the "Quality and Availability of Health Care for Heart Disease, Cancer, Stroke, and Related Diseases," and, in March, I addressed the National Health Forum on "A Resource for Quality in Health Care—Regional Medical Programs." Indeed, with all that behind me, I rashly agreed to submit a manuscript in advance. But I did not know of the several changes that would occur in my own career.

Those changes within the present year have required that I seek the advice of wise and concerned men and women about how best to utilize the resources of Regional Medical Programs, then of the Health Services and Mental Health Administration, and now of the National Institutes of Health. These individuals and groups, as well as the recent literature, testify to the view that quality in health care can be approached along several paths. The Coggeshall report, the Millis report, W. J. M. Butterfield's recent book from England on *Priorities in Medicine,* the report of the President's Commission on Heart Disease, Cancer, and Stroke, and the Manpower Commission's report are a few examples.

Furthermore, one can see the specific areas of emphasis in the current attention to quality by simply scanning the contents of the two meetings I mentioned. At the Regional Medical Programs Workshop, Carleton Chapman, a dean, focused on the relation of science and service, Lester Breslow, a health official, on the regionalization of health services, Dwight Wilbur of the AMA, on the development of personal health service, and a distinguished panel emphasized the special problems of the urban ghettos and the rural poor. The National Health Forum heard Samuel R. Sherman on quality in health care from the physician's standpoint, Leroy E. Burney on a program approach to quality, Leonard D. Fenninger on selection, training and organization of manpower, Vernon E. Wilson on continuing education, Matthew McNulty, Jr., on licensure or certification, Nelson Cruikshank on consumer utilization, Donald C. Riedel on utilization review, Roslyn Lindheim on systems use and design in medical facilities, and George T. R. Fahlund on accreditation and licensure.

Each of us could construct his own agenda for a discussion on "Quality in Health Care,"

Keynote Address, 75th Annual Meeting of the Association of Military Surgeons of the United States, Washington, D.C., October 21, 1968.

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but it would probably resemble closely the program of those meetings. In fact, most of this audience, in one way or another, has been involved in such discussions within the past year or two. Moreover, we have examined the reasons for emphasis on the subject of quality and quantity of health care, including the pressures of societal needs, the promise of scientific advances, and more recently, the growing demands of students for a sharper focus on the main issues.

The problems before us with respect to quantity and quality in medical care are not those of lack of experience, or even lack of mechanisms for assuring quality. Indeed, the paths to quality are well marked and well tested. It is not possible, however, to take only one route, since the paths intertwine and intersect. And those we choose must enable us to cope with changes of great magnitude—changes in the professional environment in which we work, and equally profound changes in the social environment. Our essential problem, then, is to apply our experience and mechanisms to these changing opportunities and challenges.

A few years ago Dr. Jack Masur, your general chairman, said:

> The quality of care is strained. It is indeed twice blessed. It blesses the hospital that provides it and the patient who receives it. But it does *not* drop as the gentle rain from heaven. The pursuit of excellence in the care of patients takes money, money and more money. Quality care can be bought at a price, and the man who is sick and in trouble is the first to agree that it is worth the price.

I would add that the paths to quality are not lightly traveled. They demand system and organization; they demand highly motivated and superbly educated professionals and technicians working in surroundings that permit and encourage the best. They demand the ceaseless infusion of new knowledge from research laboratories and clinical centers. Above all, they require the unending discontent that drives men to experiment, to question the old ways and try new ones. I believe we have traveled the several paths of quality very far and very fast in recent years. Some paths have been more productive in the past than they will be in the future, and we must seek new and improved highways for the years ahead.

In the year 1968, in this great and somewhat troubled country, there is a deep dedication, on all sides, to the improvement of health care. The question is how to do it. And the theme of this meeting is "how to do it." I have chosen to start the discussion by considering three processes. The first is the process of extending quality through association of existing foci of excellence with broader endeavors. A clear example of this is the basic rationale for the Regional Medical Programs—namely, that the best patient care, by and large, is to be found in association with academic and research institutions and may be extended in their regions. But in a larger sense, that specialized competence should be shared—not needlessly duplicated.

The second process entails focusing on the system, and I quote from David Rutstein's book *The Coming Revolution in Medicine:*

> The answer will not come merely from finding more doctors or more nurses, but rather can come only from a comprehensive systems review of the whole domain of health care leading to the interweaving of new skills, new technology, and new managerial methodologies into the total fabric. It will call for the building of new paths for the exchange of knowledge among the life scientists, the physical scientists, the doctor, the engineer, and the institutional administrator.

The third process is that of improving quality through research, on the premise that quality in health care is primarily dependent, in the long run, upon increased knowledge and its effective transmission through education.

Before focusing on these three processes, however, we may find it useful to seek a broader perspective. I ask you to turn with me to that remarkable little book *The Firmament of Time,* by Loren Eiseley. The title is from Shelley:

> The splendors of the firmament of time May be eclipsed, but are extinguished not; Like stars to their appointed height, they climb, And death is a low mist which cannot blot The brightness it may veil. When lofty

thought Lifts a young heart above its mortal lair, And love and life contend in it, for what Shall be its earthly doom, the dead live there And move like winds of light on dark and stormy air.

Eiseley goes on to say that man is at heart a romantic. He believes in the thunder, the destruction of the world, the voice out of the whirlwind. The human generations are short-lived, and we have difficulty in visualizing the age-long processes involved in the upheavel of mountain systems, the advance of continental glaciation, or the creation of life. Later he says:

A scientist writing around the turn of this century remarked that all of the past generations of men have lived and died in a world of illusions. The unconscious irony in his observation consists in the fact that this man assumed the progress of science to have been so great that a clear vision of the world illusion was, by his own time, possible. It is needless to add that he wrote before Einstein, before the spread of Freud's doctrines, at a time when Mendel was just about to be rediscovered, and before advances in the study of radioactivity had made their impact—of both illumination and confusion—upon this century.

Eiseley continues:

Certainly science has moved forward. But when science progresses, it often opens vaster mysteries to our gaze. Moreover, science frequently discovers that it must abandon or modify what it once believed. Sometimes it ends by accepting what it has previously scorned. The simplistic idea that science marched undeviatingly down an everbroadening highway can scarcely be sustained by the historian of ideas. As in other human affairs, there may be prejudice, rigidity, timid evasion and sometimes inability to reorient oneself rapidly to drastic changes in world view.

And a final quote from the latter part of his book:

In the more obscure scientific circles which I frequent there is a legend circulating about a distinguished scientist who, in his declining years, persisted in wearing enormous padded boots much too large for him. He had developed, it seems, what to his fellows was a wholly irrational fear of falling through the interstices of that largely molecular space which common men in their folly speak of as the world. A stroll across his living room floor had become, for him, something as dizzily horrendous as the activities of a window washer on the Empire State Building. Indeed, with equal reason he could have passed a ghostly hand through his own ribs.

It is important that we maintain a proper perspective regarding quality in health care.

Let me state with Butterfield that one of our first priorities is in the mental attitude of those working in the entire range of medical care services. We need better understanding of the overall situation and the details of our own work. I believe that improvements can definitely be expected through processes envisioned in the Regional Medical Programs, which acknowledge not only the differences in the goals and competences among institutions, organizations and individuals within a region, but also the advantages to be gained by a blending of resources regionally available to the providers of health services. Other examples of the principle of extension, or association, are to be found in the Veterans Administration's effective blending of VA hospitals and academic institutions since World War II, and in the partial merger of New York City's community hospitals with the teaching hospitals. Perhaps the most dramatic—but often forgotten—example is the basic decision in this country to merge research, education and services in our universities rather than depend primarily on the establishment of research institutes.

The early development of Regional Medical Programs emphasized that the target must be the needs of the patient and the region, rather than the goals of the individual institution. Further, we cautioned from the beginning that regional cooperative arrangements cannot, in themselves, supply the substance of medical care, nor can they supply the broader decision-making processes in the allocation of scarce resources between health and non-health demands. Finally, the concept of the extension of quality by coupling is of ancient origin in medicine, for it is indeed the basic concept of the preceptorship in clinical medicine and graduate work, and of the value of peer judgment, whether in the C. P. C. or the defense of a Ph. D. dissertation.

The second process has to do with the whole array of factors involved in the organization and delivery of health services. I have spoken forcibly in recent years against the development of a master plan for several reasons. We are a large and diverse nation; our knowledge in these areas is limited; but most of all we must maintain the types of motivation, innovation and cooperation that are necessary for workable arrangements.

The pressures for the development of identifiable "health care delivery systems" are increasing. Most discussions in this area seek a sharing of responsibilities and roles between government and non-government, between professions and consumers. They raise questions of the balance of manpower between those activities primarily dedicated to the protection of public health and those focusing on the delivery of personal health services. These discussions examine statements like that of George James to the effect that a single laborer shoveling fluoride into the water supply of New York City probably does more for the personal dental health of the city's inhabitants than all their dentists. Such discussions also point out that we do have some experience, such as the several excellent military medical systems, the VA system, the American Indian health service, civilian programs like the Kaiser Permanente Plan in California, and health care associations that are emerging at state and local levels.

While the commitment of Federal resources in the area of organization and delivery of health services is still limited, Congressional and Executive intent that the government do its appropriate part seems clear. An agency level Health Services and Mental Health Administration has been established in DHEW. It includes three new programs designed specifically to focus on the problems of the organization and delivery of health services—Regional Medical Programs, the Partnership for Health, and the National Center for Health Services Research and Development.

Now I should like to turn to the third of my broad highways affecting the quality of health care—research and education. Here my task is made so much easier by the announcement last week that Marshall Nirenberg had been awarded the Nobel Prize. I had been seeking a concise way to illustrate the profound change that new knowledge can make in our life and thought. Then, in reviewing one of Dr. Nirenberg's papers published in 1967, I came upon a paragraph entitled "Evolution of the Code." It reads as follows:

> Fossil records of bacteria 3.1 billion years old have been reported. The first vertebrates appeared approximately 510 million years ago, and amphibians and mammals, 355 and 181 million years ago, respectively. The genetic code may have been functional 3 billion years ago; almost surely the code is more than 600 million years old. Hinegardner and Engelberg and Sonneborn have suggested that the code became frozen by the time that organisms as complex as bacteria had evolved.

This information, this understanding will change the way we think and the way we act some time in the future. Precisely how or when these changes in behavior will come about is perhaps less important.

There is much debate about our investment in research relative to other needs in our society. During the early days of Regional Medical Programs, we almost always started with the assertion that if we really had to choose between support for Regional Medical Programs and support for medical research and education, we must choose the latter, for without research and education, a program to extend the competence growing out of scientific discovery would be meaningless. We do not have the opportunity for meaningful and significant trade-offs between research, education and service!

There are several reasons for this. First, the time scale of research makes such trade-offs inefficient. Current biomedical research is already so complex and sophisticated that we can now see before us at any one time several parts of what is now a rather broad spectrum all called "research." Included are major efforts directed to the development of overall hypotheses concerning biological phenomena. The extent to which these will emerge within a given time is unpredictable, but once we are able to visualize biologic phenomena within broad general theories, to the degree that has

been possible in the physical sciences, the nature of research and the application of its result will be quite different. It is already clear that the biological scientists of the future will need a different set of tools, particularly those of mathematics and physics, than have sufficed in the past; and not the least of our problems may be the generation gaps in our ability to assimilate the new tools that will be necessary.

Secondly, as we gaze across the span of biomedical research at any one time, we see also a series of potential breakthroughs. This is apparent as one walks into any laboratory and asks, "What are you doing?" Almost every scientists has in mind the possibility that if certain programs, certain experiments go right, then the results will yield insight into a broad array of problems. During a recent program briefing in each of the research institutes, I was repeatedly struck by the fact that here was an array of activities which, in six months, a year, ten years will have profound impacts on the direction of our research, education and service.

Finally, we do see in scanning the research spectrum the actual emergence of reasonably sure leads. Some examples of this from the past week or so would be work under way in Parkinsonism, in rubella, and in the chemotherapy of cancer. In discussions of these still unclear advances, one perceives increasingly the need to utilize the Nation's health resources in merged areas of research and practice. The very prospect of an advance in the treatment of Parkinsonism, for instance, will lead to a demand for more knowledge concerning the disease—just as the prospect of open-heart surgery more than a decade ago led to a need for each practitioner to improve his skills in diagnosis.

Similarly, the time-phase in education poses a twofold problem. First, there is the long length of the educational process in many of the health fields. Secondly, there are the rapid changes that occur in medicine. The quality of practice is dependent upon the ability to adapt to changes through what may be broadly called "continuing education." One of the main problems today is that both the organization and delivery of health services are undergoing a metamorphosis, and the nature of the educational environment and processes are being examined in a way that has not been true since Flexner's time. Although these two processes are obviously related, we are already far along in the professional education of those who will provide services in the '70's.

Another reason that support of research, education and service is not easily interchangeable is the difference in magnitude of the resources needed for each. If one looks only at dollars, the total cost of health care to the Nation is in the order of $55 to $60 billion. The portion devoted to medical research (exclusive of training and construction) is only about $2.5 billion, or 5 per cent; and the Federal share of this is about two-thirds, or $1.6 billion. While we do not have good estimates of the total investment in education and training across the total health field, the figure is closer to the $2.5 billion research figure than to the $55 to $60 billion total figure. Thus, it is clear that the need for additional funds in health services cannot be met by movement of dollars out of research and education. Even a billion dollars shifted to our health service bill, though ruinous to medical research and education, would contribute little to the service problems.

The main point to be made, however, in regard to the relationships of research, education and service, concerns neither the shortage of resources nor the problems of allocation. Rather, it has to do with foreseeing the type of health universe we want for tomorrow. If indeed we should seek a system for merely dispensing known skills and knowledge—an auctioning of available resources on the basis of current demands—the price will be very high in terms of what could be achieved in the future.

Research, education and service exist as complementary rather than alternate functions. In recent years support for research, especially at the Federal level, has been more nearly adequate than, say, support for education. But we must not deceive ourselves that we can do more with less. There are dangers in any attempt to redeploy existing resources

to achieve a short-term goal here, a medium-term goal there; and there is serious danger of disassembling a remarkable apparatus designed to benefit the American people. Perhaps the problems are seen most clearly in the present plight of our educational institutions, where confusion, some anger, and decreasing confidence mark enterprises that must be maintained as basic resources for the future.

My thesis today has been that there are indeed several paths to quality. There are many courses open which will require a variety of talents and interests, and the one that you follow may not be the one I would choose to spend most of my time on. The health professions are service professions and must be responsive to the needs and pressures of the people of our Nation. On the other hand, the health professions have skills, insights and experiences—"from research to service"—involving "quality and quantity," which link us to both the past and the future as well as to the needs of today.

I have chosen to discuss three broad paths, or processes, but I could perhaps have named twenty. Most of the twenty, however, are encompassed in these three. And the opportunities presented in these areas have been forcefully impressed upon me through recent, direct experience in Regional Medical Programs, in the Health Services and Mental Health Administration, and now in the expanded National Institutes of Health.

I find that I have quoted here from experts in the organization and delivery of health services, from a poet, a philosopher, and a biochemist. Quality is where one finds it. The social environment, the educational system, biomedical research—each in itself can augment the probability that quality will emerge. During this time when we are fully committed (as will soon be brought out at this meeting) to the extension of quality in the area of health services, our sucess in the long run will depend not on shortcuts or gimmicks, but mainly on how well we can change attitudes.

Finally, the point that seems to me the most important of all is that we cannot produce more with less—that the process of borrowing from Peter to pay Paul, or of playing a game of musical chairs in which one resource has been removed or a player added each time the music stops, can only succeed in disrupting the impressive health organization and mechanisms that have been built up so laboriously over generations.

We can be encouraged by the fact that we know much more about the conditions required for quality in health care than we have been able to apply. Your challange over the next few days is to explore in depth how those conditions can be instituted and the potential quality achieved.

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TAB 4

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The first Harold S. Diehl Lecture is devoted to a review of cancer research over the past two decades as contributing to our knowledge of basic processes in human biology, and of environmental health problems. On this basis the implications of "categorical research" are examined in the light of current criticisms.

CANCER RESEARCH—A STUDY OF MAN AND HIS ENVIRONMENT

Robert Q. Marston, M.D., F.A.P.H.A.

THE establishment of the Harold S. Diehl lectureship marks an important milestone in the American Public Health Association's long history of contributions to the field of public health. Through this annual event, sponsored jointly with the American Cancer Society, we shall be able in a modest way to recognize Dr. Diehl for what he has brought to all of us: a strengthened belief in the potential of medicine to improve the lot of man.

It has often been said by observers of the American scene that we demonstrate a genius for voluntary association. High among the nation's voluntary agencies one must rank the American Cancer Society, which exhibited great wisdom in seeking out a medical educator of Harold Diehl's stature. The decade of service he gave the Cancer Society, following his retirement as dean of the University of Minnesota Medical School, was particularly notable for the agency's assault upon smoking as a major threat to health.

The subject I have chosen to discuss in this initial lecture honoring Dr. Diehl is "Cancer Research—A Study of Man and His Environment." My thesis is that the accomplishments of the cancer field in recent years are indeed best described as a contribution to human biology. My purpose is to examine the role of cancer research—first, as a major contributor to basic research, including improvement of our understanding of the life processes, and secondly, as a source of information concerning the alarming impact of our environment.

There are lessons to be learned, not only from the unusual productivity of biomedical research in this country, but from the way that we have gone about research, breaking across the barriers of the disciplines of science. We can also profit from studying our methods of supporting research through the combination of voluntary, governmental, university, research center, industrial, and other resources. Particularly pertinent to this discussion is the almost unique definition of the categorical approach to research, which grew first from the efforts of the voluntary agencies in America, and was then adopted by the federal government, particularly by the National Institutes of Health.

A Decade of Progress

Today there is much discussion of the dangers of the categorical approach: fragmentation, distortion of larger pro-

grams, confusion in setting priorities—to name only three of the more serious criticisms. I am quite as concerned as anyone with such dangers, but my purpose here is not to argue the merits of the categorical approach. Rather, it is to review in a general way the past 20 intensive years of cancer research—to see whether progress in the diagnosis, prevention, and treatment of cancer has also increased our understanding of the biology of man and the interaction of man and his environment.

I shall start with some of the direct effects of those 20 years of effort. During the great expansion of cancer research following World War II, it was common to see investigators turn their sights upon cancer itself and, after frontal attacks of a year or two, return to basic research within their disciplines. The base of fundamental knowledge was simply inadequate to cope directly with cancer on all fronts. Yet it was clear that every discipline of modern medical science had a role to play. Despite the complexity of the cancer problem, there have been major advances that have enabled physicians to treat their patients more effectively. The gains are reflected in the over-all statistics:

In the early 1900's few cancer patients had any hope of cure.

The five-year survival rate in the early 1930's was about one in five.

Ten years later, one in four.

Currently, about one in three.

There are about 1.4 million Americans alive today who, five years after diagnosis, show no evidence of the disease.

And this year, on the basis of five-year survival, about 190,000 Americans will be saved.

The American Cancer Society makes a strong and quite tenable plea that many more lives be saved through vigorous application of the knowledge now available.

Today we have a clearer perspective on the cancer problem and a more definite conception of the needs and opportunities. We are in the process of translating what has been a rather casual *multi*disciplinary alliance into a broad, intensive *inter*disciplinary attack. For we have reached the point where our knowledge of the characteristics of neoplastic disease in general, and of certain cancer types in particular, permits the launching of specific problem-solving programs. These include, for example, the special virus-leukemia task force of NIH's National Cancer Institute.

The types of cancer which are probably most vulnerable to the newer knowledge at hand are acute leukemia, Hodgkin's disease, Burkitt's lymphoma, lung cancer, uterine cancer, and choriocarcinoma. These diseases are either preventable, as is probably the case for much lung cancer, or could be cured in more patients than are now saved, as in choriocarcinoma through the use of drugs.

While there is perhaps more optimism at present concerning cancer than we have ever seen before, it is also true that the magnitude of the problems to be overcome is so great that both physicians and patients will undoubtedly face disappointments as expectations repeatedly exceed our ability to deliver. Those of us in the health field must proclaim often and loudly the word *caution*!

The second area I wish to examine is the role of cancer research in improving our understanding of basic human biology. We are not yet at the point of being able to develop a generalized theory of cancer, though some see the possibility of relating its etiology to the phylogenetic development of immune processes. Others discuss whether cancer should be regarded as an infectious disease—eradicable, in the same sense as poliomyelitis has almost been eradicated in America. And still others emphasize the potential to develop cancer as an

inherent condition of almost all cells.

I shall limit my discussion of the contributions of cancer research to human biology to an examination of the constant process of exchange between cancer research and the general field of microbiology, each making many definitive contributions to the other and together carrying us to a clearer understanding of basic life processes. I could have chosen to examine, of course, the contributions that cancer research has made in the area of genetics, in the whole unfolding of modern biochemistry, in the impact of chemotherapeutic trials on pharmacology, or any of a number of similar interactions between cancer research and other life science fields.

Cancer research was both the source of support and the scientific stimulus for many of the early tissue culture workers, such as Wilton Earle at the National Cancer Institute and George Gey at Johns Hopkins. The availability of the techniques of tissue culture made possible a revolution in microbiology in the 1950's.

Today, many feel that viruses will be found responsible for at least some human and domestic animal leukemias and that preventive or control measures, including vaccines, can be developed. As a result, much cancer research being carried out in this country could be termed "cancer virology." Congress, in 1964, provided supplemental funds to support special programs, complementing the extensive research in this field which is financed through the regular grants mechanism. The main objectives of these programs are: (1) to devise effective means for the treatment of cancer in man; (2) to determine whether viruses comparable to those now known to cause cancer in laboratory and domestic animals are causal agents of human cancer; and (3) to develop an effective vaccine or other means for the prevention of these diseases if such etiologic agents are revealed.

Relationship to Microbiology

Microbiologists began serious studies on the virology of cancer shortly after 1900, following the discovery of several tumor viruses in chickens. Today, over 60 different viruses are known to be capable of inducing cancers in every major group of animals, including subhuman primates. Viruses or virus-like particles of different types can be detected in patients with different forms of cancer. Particles of one type are similar to those known to induce leukemia and lymphoma in laboratory animals. Particles of another type are similar in size, shape, and chemical makeup to the classical herpes viruses of man, and apparently also to a herpes-type virus now thought to be associated with Marek's disease—a prevalent form of leukosis in chickens. And largely within the past year, a third particle similar to the mouse mammary-tumor virus has been reported in human breast cancers and in milk from breast cancer patients.

The importance of these findings is still unknown. Thoughtful scientists would predict that, over time, some will prove to be red herrings as far as their causal relation to cancer in concerned. On the other hand, it seems clear that from this type of cancer research we will proceed to a much clearer understanding of the relation of viruses to man. If viruses are, in fact, responsible for some of man's cancers, it may be possible to apply some of the well-developed methodologies of microbiology to their control in the future.

The property of certain viruses to replicate selectively in animal tumors, and the understanding of how bacteriophages replicate and destroy their host cells, have stimulated renewed investigations on the capabilities of viruses to destroy human tumors. In some patients deliberate infection with such modified virus preparations has led to dramatic tumor regressions. Once again, while it

is not known whether this information will contribute to the diagnosis and treatment of cancer, the ability of viruses to carry genetic information into tumor cells, and to change their way of doing business, has significance throughout the whole field of human biology.

Another example of the mutual relationship between cancer research and microbiology is seen in the potentially important results of NIH investigators studying the mechanism of action of interferon, an antiviral compound of wide interest to scientists in recent years. Interferon is a natural substance produced by all mammals, including man, and represents one of the main defense systems against virus infections. Upon being infected by viruses, man and animals produce interferon which circulates through the bloodstream and confers resistance to the spread of the virus.

There has been an increasing effort to develop noninfectious materials that can cause animals or man to produce large amounts of interferon. About a year ago, scientists at Merck published reports that the synthetic double-stranded RNA, polyinosinic-polycytidylic acid, or poly-IC, can cause animals to synthesize large quantities of interferon.

A program was undertaken at the National Institutes of Health to explore the mechanism by which poly-IC caused cells to make interferon. One of the investigators was moved by a scientific "hunch," based on very basic observations of his, that the compound might affect the growth of cancers. To summarize the animal experiments, eight different kinds of cancer in mice were examined, and the growth of all eight was inhibited to some degree. With some types of cancer, the decrease in growth and the prolongation of the animal's life were small; in others, apparent cures were effected. All of the cancers tested were virus-induced or transplanted; thus no information concerning naturally occurring cancers is yet available.

The importance of this work for our discussion today is twofold. Here is yet another example of where (1) a direct attempt to find a cure for cancer is likely to increase our understanding of cell biology, and (2) this understanding, in turn, may increase the potential for control of cancer some time in the future.

If we turn now to the contribution that cancer research has made to environmental health problems, we can again choose among a rich array of examples. And again the categorical approach has led to results that go far beyond the initial problem or disease category. Cancer research, in its great breadth and depth, has yielded information and techniques that are opening new vistas in the environmental health sciences. Consider the closely interwoven areas of chemical carcinogenesis and epidemiology.

The story of the evolution of chemical carcinogenesis is a familiar one dating from Pott's classic observation of scrotal cancer in chimney sweeps, to the present era when scores of specific chemicals have been identified as actual or potential cancer-inducing agents. Epidemiology, a more ancient science, has been applied only in recent times to chronic diseases, particularly cancer occurring in specific occupational settings. Several cases in point are bone tumors in radium dial painters, bladder cancer in aniline dye workers, and lung cancers in uranium mining and the asbestos industry.

The two disciplines of epidemiology and chemical carcinogenesis have served as the principal underpinnings of a monumental effort to elucidate fully the role of tobacco in disease production. Although the use of tobacco has been a subject of some controversy for hundreds of years, a conspicuous association between smoking and lung cancer

was not noted until our own time. Observations in the 1930's prompted an increasing number of epidemiologic and laboratory studies, mostly conducted since 1950. This painstaking, difficult, unglamorous work, which has drawn on the knowledge and skills of many other disciplines, has served to identify cigarette smoking with the rising tide of lung cancer and a number of other diseases.

Perhaps even more importantly, these studies have also served to provide a technical and conceptual staging area for mounting attacks on a variety of other health problems. It has become increasingly apparent that in order to solve these problems we must call on professionals in a host of disciplines outside the traditional life sciences. These include sociologists, psychologists, economists, engineers, physicists, systems analysts, educators, and others who understand and can explore and influence the diverse elements of man's environment.

Our conception of disease causation has evolved in recognition of the fact that multiple environmental factors, endogenous and exogenous, can play a part, and that differing elements of a complex environment can interact to produce a variety of problems.

Cancer research has had a major impact on the control of the use of drugs, stimulated by the understanding that substances in widely differing categories might be carcinogenic. The development of techniques, though still imperfect, to detect this potentiality has stimulated the whole field of drug testing. In like manner, the discovery that some human viruses may cause cancers in experimental animals and may occur as contaminants in tissue cultures has led to a revision and reexamination of the controls needed in the manufacture of biological products.

Finally, the immediate and most forceful evidence of the need to explore ways to control the pollution of man's environment has come through the demonstrations in experimental animals of the carcinogenic potential of some environmental pollutants. This focus of attention on the problems of environmental health arising out of cancer research may urge us to come to grips with the far broader implications of a soiled and deteriorating environment while there is still time to do something about it—not only those of us who are interested in research, but also those with responsibilities in political, sociological, and philosophical fields.

In summary, let me repeat that the study of cancer has prompted inquiry and yielded knowledge in the broader study of man and his universe. Penetration of the mystery of cancer has stimulated research on man's environment, biology, and behavior.

Not only have new effective weapons against cancer emerged, but we now see a far clearer picture of what must be done to solve other problems of health and disease. We see that the attack must proceed on many levels, from basic and applied research to more vigorous programs of education, motivation and health service. Moreover, the support and conduct of the attack on disease, as in the case of cancer, must be a collaborative effort of renewed intensity.

My thesis—that the study of cancer is the study of man and his environment—contains a broad principle applicable to the advancement of health knowledge. The principle is this: that our *general* knowledge of health and disease may be advanced by investigating a *particular* disease—by the categorical approach. But it is important in defining "categorical approach" that we take a broad view. In focusing initially on cancer, bioscientists have furthered investigation and made valuable discoveries about other health problems—from the most fundamental facts of life, such as genetic transmission, to the interaction of man with his environment.

In the future we shall need to explore many ways of supporting biomedical research in this nation. It is essential that we find new ways to give broad institutional support to maintain the environments in which research and education can proceed. It is important that we consider all evidence in terms of setting national priorities. And it is important that we maintain conditions in which there is easy communication between disciplines.

In making these decisions we must examine the evidence from time to time, rather than simply make assertions. In reflecting on cancer research as a means of furthering man's knowledge of himself, I have become convinced that the record shows this entire experience to have been a most worthwhile and effective one.

I should like to digress here to make some general observations concerning current problems. There is much talk today of crisis in medicine. Frequently in the search for the causes of this crisis, there is an examination of the areas of relative success and relative deficiency. At a time of constrained budgets, at the federal level at least, the question is asked whether it is not possible, in effect, to borrow from Peter to pay Paul—to take from research to support education, or to take from education to support direct services.

While I feel strongly the need to change our institutions in order to meet more adequately the demands of the times, I am convinced we must avoid the easy answers, the trade-offs between elements that have a different dollar magnitude and a different time scale. We must do it in such a way as to match our aspirations for grand designs to the availability of resources. We must add to what we have been doing, not subtract from the areas of success. And we must be careful not to dismantle our remarkable biomedical research and educational apparatus.

Dr. Marston is Director, National Institutes of Health, U. S. Department of Health, Education, and Welfare, Bethesda, Md. 20014

This paper was presented before a Joint Session of the American Cancer Society, the Public Health Cancer Association of America, and the American Public Health Association at the Ninty-Sixth Annual Meeting in Detroit, Mich., November 12, 1968.

TAB 5

#560

MEDICAL RESEARCH FOR THE SEVENTIES*

Robert Q. Marston**

Mrs. Lasker, Distinguished Guests, Members of the Lasker Award Committee, Mr. Chairman, Ladies and Gentlemen:

I stand before you two and a half months after assuming the position of the Director of the National Institutes of Health--a job described by President Johnson as staggering and by the Secretary of Health, Education, and Welfare as one with tremendous challenges. Yet I have found during this brief time, experiences so heartening, advances so promising, and support from all segments of our society so firm that I want to report to you a most stimulating endeavor, with tremendous potential even when viewed against the background of the remarkable accomplishments of past years.

New NIH Responsibilities

The National Institutes of Health is dedicated primarily to the conduct and support of research on the major diseases of man. This staggering task demands a big organization. The NIH program has contributed to every major health institution in the country and has benefited directly or indirectly every citizen. For almost every medical advance in this country in recent years has been supported to some degree by NIH programs. In general, the dollar support has been greatest in those areas of greatest death and disability--cardiovascular disease, cancer, arthritis and metabolic diseases, neurological diseases, allergy and infectious diseases, dental diseases, and the problems of child health and human development. Support is also extended to research training, institutions, and special resources.

On April 1 of this year, two new organizations and two new responsibilities were merged with the research mission of the National Institutes of Health. The charge is to blend in a purposeful and effective way the Federal Government's resources in medical research, education of health professionals, and biomedical communications. The resources of the Bureau of Health Manpower and of the National Library of Medicine will be severely taxed during the next few years as they seek to meet the urgent needs in their fields.

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*Delivered at the Lasker Award presentation, New York, N.Y., November 21, 1968.

**Director, National Institutes of Health, U.S. Department of Health, Education, and Welfare.

Contributions of Research

But our object today is to focus on the contributions of research. Those of the past and the potentials of the future, owing largely to the active work or stimulus of individuals present in this room, have created a research structure unparalleled in history. It can be truly said that for this generation at least, and surely for the decade ahead, all mankind is heavily dependent on the continued support of American biomedical research through the National Institutes of Health.

Indeed, the two major problems of the whole health field--the increased cost of care and the problem of service to the disadvantaged--will be affected to a great extent by the results of research. The single most important determinant of the nature of the practice of medicine, in the future as in the past, is clearly the progress of medical science.

Such progress depends, in turn, upon the caliber of the people entering research. I am impressed with the evidence I see of talent fostered in university and other laboratories throughout the Nation, and of the excellence of young investigators emerging from research training programs and participating in the formulation of broad policies and strategies. These are the men and women who must decide how to explore the unknown. And they are betting their careers, their life's work, that the research they are doing is in the right direction--that it will pay off.

In early September, Institute by Institute told me of progress along three general lines.

First--toward a better understanding of the nature of life processes. An excellent example is the work for which Dr. Khorana and, to speak with pardonable pride, our own man Dr. Nirenberg are to receive a Nobel Prize.

Secondly, there were reports of very promising leads, which will probably result in major modifications of medical practice in the 1970's.

One example is the firm documentation of major risk factors in coronary artery disease, the main cause of heart attacks. The major risk factors are smoking, hypertension, and high serum cholesterol. All three together increase the risk of heart attack by more than five times. The presence of only two factors lowers the risk from this high level to about twice the average, while the presence of only one factor drops the risk to nearly average.

We can look forward to continued improvement in treating hypertension. The use of cigarettes seems to be decreasing. And field tests of lipid-lowering agents are currently under way to determine their potential for preventing second heart attacks.

Dental scientists now predict progress on a number of fronts, such as the elimination of dental caries as a major problem in the '70's.

There were reports of major advances in the development of artificial kidneys.

A new program to control pneumococcal pneumonia through use of a vaccine was announced yesterday.

A virus infection in rabbits and a variety of tumors in mice have been controlled by inducers of interferon, as announced just last week by NIH scientists. Whether the control of these tumors is attributable to the action of interferon, a natural defense against viruses, remains to be determined.

Application of Research Findings

A third line of progress concerns the endeavor of the various Institutes to make the fruits of research available to the patient without undue delay. Of several possible examples, let me select two.

It appears from the work of George Cotzias and others that administration of l-dopa to patients with Parkinson's disease can be an effective weapon in the hands of the physician. Dramatic improvements are seen, and up to 75 percent of patients are expected to benefit from the drug. But there are serious and unpleasant side effects and problems of supply reminiscent of the early days of penicillin. To solve problems of this character without extraordinary measures would probably take years. Therefore, the National Institute of Neurological Diseases and Stroke has held meetings with an expert task force, and will carry out, within the shortest time compatible with sound scientific principles, a cooperative program for testing l-dopa and other compounds for efficacy and safety.

The program will be supported in some 20 institutions throughout the Nation. Further aims are to determine any long-term effects of these drugs, and to see that an adequate supply of pure compound is made available to the scientific community for further basic and clinical research.

Another interesting feature of the l-dopa story is that the formulation and testing of the underlying hypothesis--that l-dopa should benefit Parkinson's disease patients--was made possible by a vast amount of basic scientific work on nerve impulse transmission. Indeed, one of the recipients of last year's Lasker Awards, Dr. Bernard B. Brodie, contributed significantly to this body of knowledge through studies of the central mechanisms by which reserpine regulates blood pressure.

The second example derives from our growing ability to utilize resources rapidly--to capitalize on research findings. This is seen in

progress towards the control of German measles. First there was an exploratory period following the discovery of the devastating effects of this infection when it attacks women in early pregnancy and causes congenital defects in the child. The second phase was the development of an effective vaccine. Tests of this experimental vaccine have already been made in this country and abroad with quite encouraging results. We feel fairly confident that by 1970, when the next German measles epidemic is expected, a safe and effective vaccine will be available.

Think for a moment of the implications of this advance. Everyone in this room had as a child the normal childhood diseases--mumps, measles, German measles, whooping cough--and perhaps scarlet fever, rheumatic fever, diphtheria, and poliomyelitis. In the 1970's, all of these childhood diseases should have disappeared in America.

Conclusion

Today the United States leads the world in medical sciences. This is not accidental, but rather a direct result of painstaking and sometimes spectacular research in laboratories and clinics across the land. This is a consequence of governmental, industrial and private support. And it strongly reflects the visionary, spirited and tireless efforts of private citizens, such as those in this room.

We have a grave responsibility to foster the present apparatus for research and education in medical science. If we continue to build well now--and we cannot afford to fail in this--we can look forward to accelerated payoffs in the decade ahead. There will be payoffs in a deeper understanding of the basic processes of life; in continued advancement in the control and cure of disease; and in new research opportunities, which are often the most exciting results of all.

TAB 6

#568

THE EXPANDED ROLE OF THE NATIONAL INSTITUTES OF HEALTH*

(Abstract)

Robert Q. Marston, M.D.**

The role of the National Institutes of Health--traditionally, the conduct and support of medical research--now includes programs for education of students in the health professions and occupations and for communication of information in the health sciences and services. This has resulted from a reorganization of the Department of Health, Education, and Welfare on April 1, 1968, which assigned to NIH the Bureau of Health Manpower (since named the Bureau of Health Professions Education and Manpower Training) and the National Library of Medicine.

The responsibilities and opportunities ahead for the expanded NIH will increase. We will continue to conduct diversified programs of laboratory and clinical research in our own facilities; continue to give broad support to all types of biomedical investigation in medical and dental schools, universities, and other research centers throughout the country; and strengthen the efforts to meet national needs in medical communications and health manpower.

The coupling of the medical research capabilities of NIH with the rich resources and efficient machinery of NLM and BHPEMT has put NIH in a unique position for dealing with the most pressing problems in the health field.

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*Presented at the Annual Conference of the State and Territorial Health Officers with the Surgeon General, Washington, D.C., 12/11/68.

**Director, National Institutes of Health, U.S. Department of Health, Education, and Welfare.

TAB 7

1969 ANNUAL MEETING · CHICAGO · AUGUST 18-21

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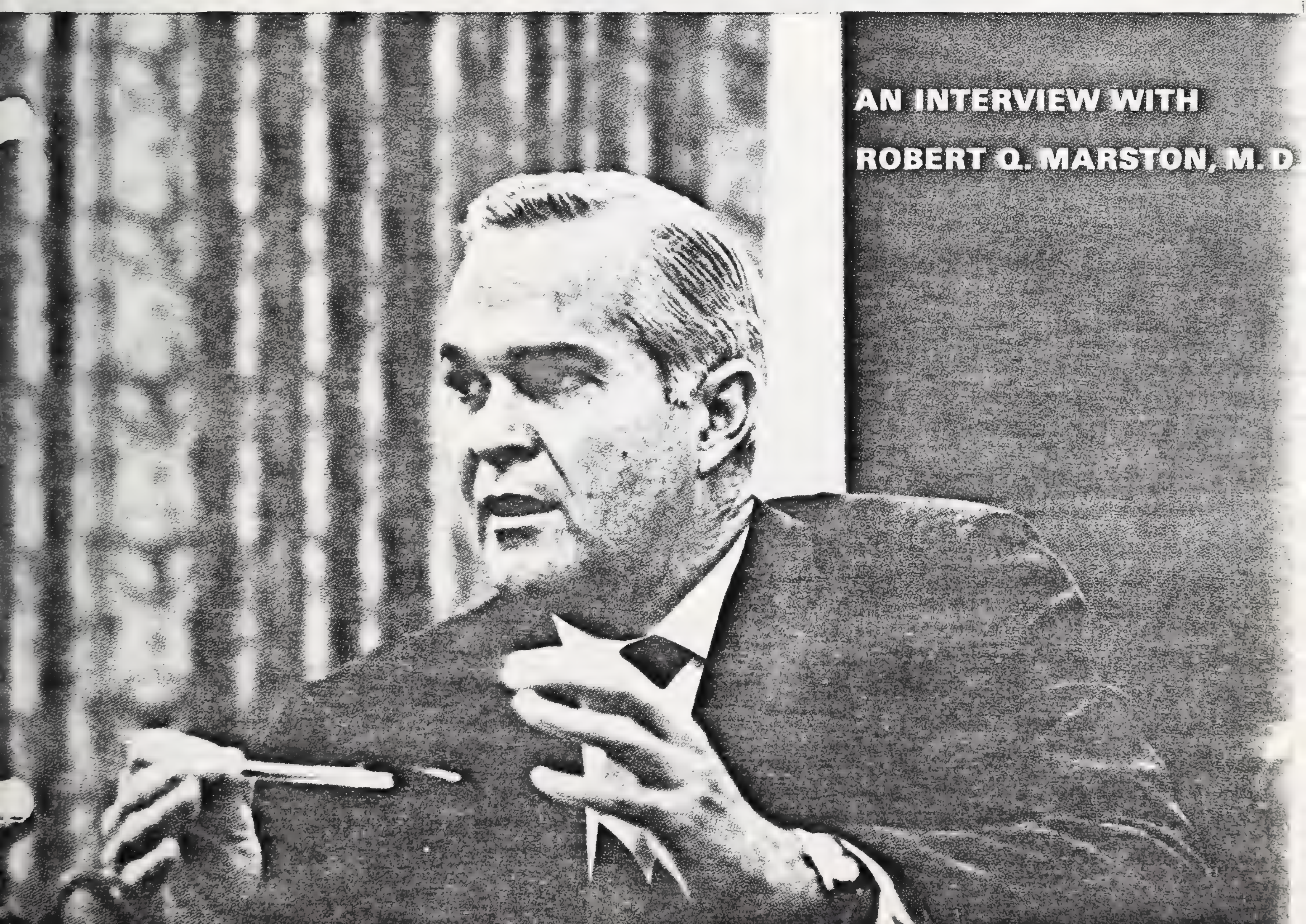
AN INTERVIEW WITH ROBERT Q. MARSTON, M.D



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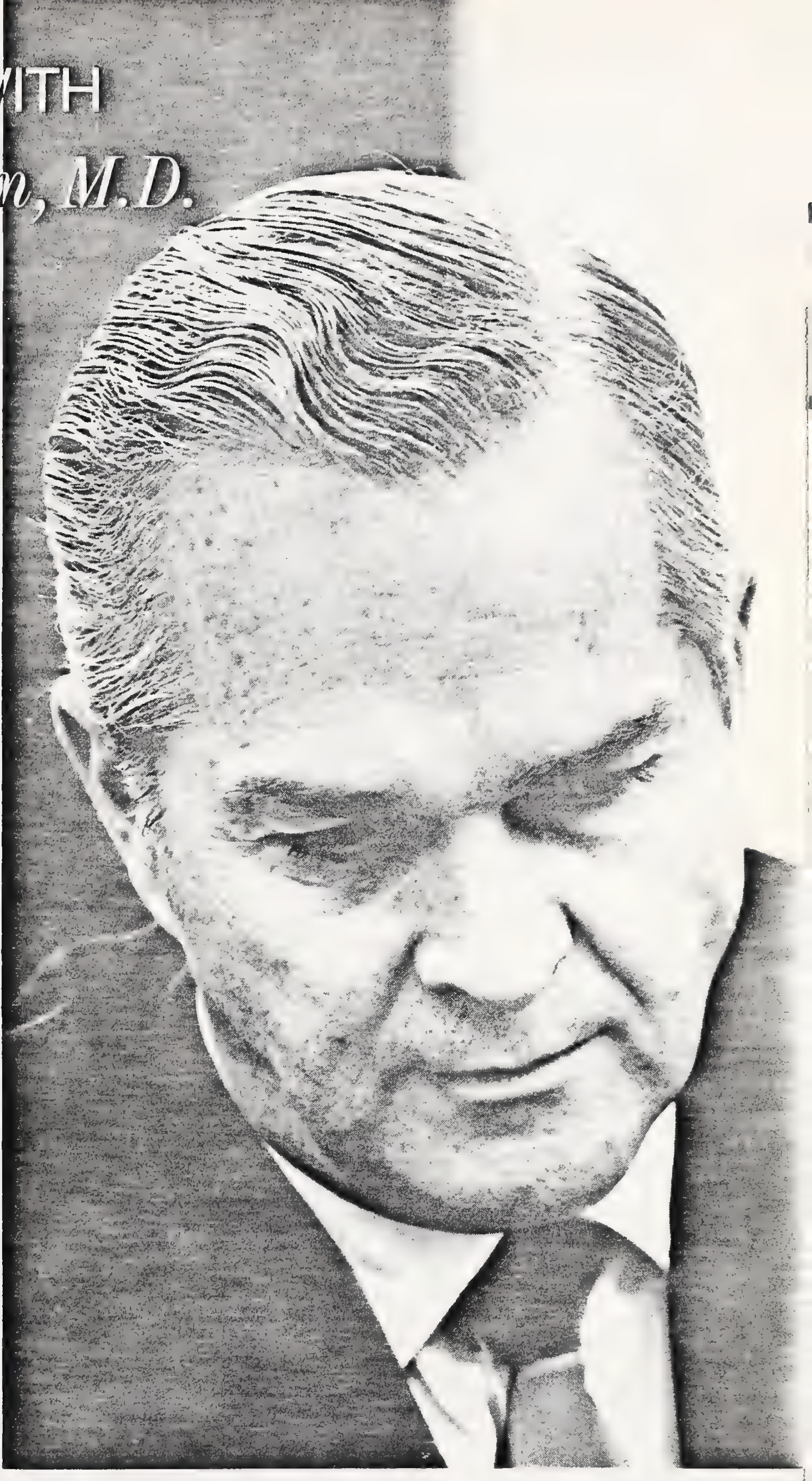

by MICHAEL LESPARRE

The new director of the National Institutes of Health discusses plans and problems of the world's largest biomedical research complex

ROBERT QUARLES MARSTON, M.D., has had, since Sept. 1, 1968, the awesome task of directing the National Institutes of Health. His principal domain is a 300-acre campus in Bethesda, Md., a suburb of the nation's capital, on which are clustered hundreds of laboratories, a 516-bed clinical research facility known as the Clinical Center, and the National Library of Medicine. His staff consists of approximately 11,000 full-time scientists and supportive workers. His current budget of $1.6 billion includes the federal funds allocated for intramural studies, and grants made for research to universities, medical schools, hospitals, clinics, and other nonprofit research and teaching institutions.

So gigantic are the responsibilities that befall the NIH director that President Lyndon B. Johnson, a man comfortably attuned to bureaucratic complexity, has described the job as "staggering." The assignment, however, could scarcely be less than that. The eight constituent units of NIH are charged with the

conduct and support of research on the major diseases of man. Recently, through the administrative addition to NIH of the Bureau of Health Manpower and the National Library of Medicine, NIH also became responsible for the federal government's interest in biomedical communications, and the education of health professionals.

Dr. Marston has had eight predecessors, the most recent being James A. Shannon, M.D., who, after 13 years of service, retired from NIH to become a consultant to the National Academy of Sciences. All NIH directors have been physician-researchers of distinction and, while different in personality, have shared the capacity to think big and dream expansively, yet maintain the calmness that is the hallmark of the scientific mind.

Dr. Marston is no exception. As the new director of the world's largest agency to administer biomedical research, he is less impressed by the size of the organization or by his task than by NIH potentials. Mindful of budget, he turns to published references or to an aide when queried about the dollar volume of specific research, but he calls for no additional resources in discussing the major risk factors of coronary artery disease; human development; or the meaning to families when in the 1970s, as he predicts, all of the major childhood communicable diseases will have been brought under control in the United States. To him, the future possibilities at NIH are the romance of his assignment: major advances in the development of artificial kidneys; a program to control pneumococcal pneumonia through the use of a vaccine; the likelihood that dental caries as a major problem can be eliminated in the 1970s; the timely development of a safe and effective vaccine to control German measles that will head off the epidemic expected in the following year.

A youthful, modest man who smiles readily, Dr. Marston is a graduate, class of '47, of the Medical College of Virginia, his home state. As a Rhodes scholar with a soft Virginia accent he still retains, he worked with Nobel Prize winner Howard Florey at Oxford, England, until 1949, then served an internship at Johns Hopkins Hospital and a year's residency at Vanderbilt University Hospital in Nashville. When he joined the NIH staff in 1966 as director of the division of Regional Medical Programs, he was not yet 43 but had been dean of the medical school of the University of Mississippi for five years and, for one year, vice chancellor of the university as well. These are but bench marks in 20 years of study, administrative work, teaching, and writing and publishing.

Early in 1968, to the regret of the many who worked with him in establishing RMP and in gaining professionl endorsement for the program, Dr. Marston was named administrator of the new Health Services and Mental Health Administration. It was from this post, held only for a few months, that he was called upon to direct NIH. He dismisses lightly the suggestion that his diplomacy was the key to the gains achieved in RMP. If he is diplomatic, good—so be it.

His primary concern for today and for tomorrow, a topic to which he hastens, is the impact of research on human life. He holds firmly that the two major problems of the health field—the increased cost of care and the problem of providing service for the disadvantaged—will be affected directly by scientific breakthroughs. It was in this context of research as a vital force in our society that Dr. Marston made the following comments in his office. Human resources, more than money, he said, are leading determinants in the application of research findings, and it is on these resources that he bases his optimism and confidence for the future.

Dr. Marston, as director of NIH for only a few months, what are some of your earliest impressions, and some of the objectives that you foresee in your administration?

I have really been at NIH for a considerably longer period, so my observations of recent months are simply from a different vantage point. I worked as a scientist here in the early fifties. I was part of the advisory structure for another five years, and an associate director for almost three years, so my present assignment is related to considerable previous NIH experience.

The first things I have had to give attention to are the organizational changes that took place last April. The overall activity of NIH was broadened to include the Bureau of Health Manpower and the National Library of Medicine. Although my predecessor, Dr. Shannon, had initiated the appropriate staff work, the organizational steps had not yet been taken for administering the new changes. Today, NIH is responsible not only for federal health research but for education and biomedical communication as well.

The second order of business for me was to discuss program, opportunities, and progress with each of the NIH units. This was a very valuable experience in terms of reassurance about the soundness of the operation and in getting a grasp of the excitement in these various areas. I found it very stimulating and the potential greater than I had imagined.

I think one of the problems of highest priority is to be sure of the identification of NIH as an agency concerned with helping people. In recent years, some of the public and some of the professions have seen the growth of NIH in terms of size and dollars. They have little concept of how the dollars are being spent or what NIH is responsible for doing toward the public good. This story must be understood.

What are you doing specifically to bring a better understanding of the nature of the Institutes and to dispel the myth of a large, not-quite-human agency?

As the NIH programs have increased in number and scope, and as the appropriations to support those programs have increased in size, we have acquired a greater responsibility for public accounting of our stewardship of public funds. To do this, we must take greater initiative to reach the many publics that can profit from the product of our work—new knowledge. Dr. Shannon last summer appointed a top-level group to work on this, and as a result, a number of new approaches are being used to meet our responsibilities in this area.

Do you see the National Library of Medicine as being the clearinghouse of all such information?

No, the problem is not that simple. I think public information concerning a program has to be fairly close to that program. In the case of the rubella vaccine, however, it has been necessary to coordinate activities at several levels—among the people at the Communicable Disease Center, the Institute of Infections and Allergic Diseases, and the Division of Biologics Standards. Information people and those working in programs have been involved. On the other hand, the National Library of Medicine is more broadly the focus for biomedical communication. Its responsibility in its long history has been the exchange of information among professionals.

Do you consider as a primary problem in the field the time lag between research findings and the application of those findings in health care institutions?

Yes, and the National Library of Medicine in recent years has had to make very important decisions in this regard, among them that a library has responsibilities beyond being a repository of information, and that it does have a role in the specific distribution of that information. This is a vital function and one that will require much of Dr. Cummings'* and other individuals' attention at the library.

But it's not always a matter of information lag. Probably the greatest handicap is the scarcity of trained people. If an area doesn't have a hospital, or a physician, or a nurse, then this can be the primary block. The human resource—the trained persons—can be the greatest problem in making research findings available. Identifying the human resources is, of course, the responsibility of the Bureau of Health Manpower, now a part of NIH.

It is obvious from some of your recent statements that you have lost none of your interest in the Regional Medical Programs. Does your present NIH assignment have a relevance to RMP that will permit your continuing participation in the program?

I am pleased to say yes. Many of the problems of the Regional Medical Programs cross over categorically with the problems of the Institutes, so I look forward to a productive and healthy liaison with RMP.

Do you have a theory as to why hospitals have not become more involved in Regional Medical Programs?

RMP as a program started out to fit the needs of many different groups and interests. It is difficult to convey at the local level the concept that this program was not designed to meet the specific needs of

*Martin M. Cummings, M.D., director, National Library of Medicine.

the hospital, of the physician, or of the medical school, but to meet the needs of a region. Hospitals wanted to know how RMP would help them. But the program wasn't designed to do that. It was designed to help the health resources in an area become more effective.

The AHA conference on Regional Medical Programs held in Chicago last June addressed itself precisely to this question and, in fact, was organized because hospital leaders were concerned about participation. The conference pointed to ways for increased participation in the program and showed that in some parts of the country hospitals were deeply involved, whereas in others they were not involved at all.

What do you think is likely to happen in such programs as RMP, Comprehensive Health Planning, and Hill-Burton, that share a concern about planning—are these programs ever likely to converge or be coordinated in some way?

This is a complex question. We must consider not only the appropriate role of the federal government, but also that of local government, of hospitals, and of the private sector of the community. All of these programs, we must remember, are designed for different goals, and it is still an open question as to the extent of combining their functions into a single entity. I had the choice of whether to bring RMP and Comprehensive Health Planning together administratively when I was administrator of the Health Services and Mental Health Administration, and after talking to many people I decided if there was a problem before one did that, there would be a problem, perhaps even greater, afterward. The more natural move seemed to be to bring together the Division of Chronic Disease Programs and the Regional Medical Programs. On the other hand, the comprehensive health legislation seemed to fit in more naturally with programs in medical care administration. These are now in the Community Health Service, a component of the Health Services and Mental Health Administration.

What do you feel hospitals should do to provide creative leadership in behalf of Regional Medical Programs?

The problem is that, in addition to taking a broader community view, hospitals have so many other problems such as new ground rules for Medicare, rising costs, and the rapid shifts in hospital staffing. Their attention is drawn primarily to their own internal problems, but at the same time they have been asked to participate more broadly in area programs. The basic message is that all providers of health services must now take a rational look at the concept of community rather than individual resources and assist in the search for solutions to areawide problems of many kinds. If hospitals compete with each other regardless of the community need, as some have tended to do in the past, then we are going to have real problems. Leadership must begin with an appraisal of community needs and the hospital's role as part of the total community.

To return to the more basic objectives of NIH, Dr. Marston, in your opinion is there too much duplication of research in the biomedical sciences?

First of all, it would be unfair to assume that duplication is necessarily bad. I remember a lecture given here by Dr. Albert Sabin, who was responsible for the live polio vaccine breakthrough, when he spoke of the role of viruses as a possible cause of cancer. About one-fourth of his lecture was related to the fact that he was unable to duplicate the findings of another investigator. But in searching out *why* he was unable to duplicate such findings, he uncovered the importance of genetic purity in animals in these experiments. In addition, he defined the specific physiological conditions necessary for the production of cancer. So had it not been for some duplication of work, several major steps in the study of the relationship of viruses to cancer would have been missed.

Much progress comes through such efforts to understand why two investigators or two laboratories get different results. It seems to me that the best assurance we have that there will not be useless duplication is the fact that researchers are really betting their careers and their lives against the results of their work. An investigator surely won't waste three years of his life if he can help it.

What about the dollar volume of research? Did the congressional budget cutbacks of last year impede biomedical studies appreciably or reduce their number?

Yes. Actually, there has been no increase in the number of NIH research grants since 1963, in spite of an increase in total dollars. There are several reasons—the element of inflation, for one; another is the increasingly complex instrumentation and equipment that are required, and frequently, as the research becomes more sophisticated, the team must become larger. Also, there is a tendency now to group grants together, which tends to create a greater sense of stability—the researcher is more secure in working on one phase of a larger effort, for example, than with a small grant.

As a result of the cutback, we have negotiated decreases with investigators in areas that in the past have been more or less immune from cutbacks—the so-called "moral commitments," for instance. All such negotiations have required the approval of the institutions involved, and the decrease has averaged about 15 per cent. Whether we'll have to continue at that level, I don't know, but the added restriction is bound to have a very serious effect on institutions, because a broader base is needed for expansion in the number of medical schools, dental schools, and other educational programs and because of the current atmosphere of uncertainty.

Is there anything to the belief that the growth of federal research efforts, evident in the growth of NIH, tends to diminish private research and enterprise?

In making general purpose research grants, we have given due credit to institutions conducting private research, but without startling success in terms of increased private research efforts. To answer the question more directly, there is no doubt that federal ventures in research have grown more rapidly than nonfederal. But nonfederal sources have grown in all areas as well.

Since 1948, federal research has increased in dollar volume from $50 million to $1.6 billion; the nonfederal sector of research in this country has grown from $74 million to nearly $1 billion in the same period. One might conclude that there are so many research needs in the biomedical aspects of health that private agencies and foundations have never had trouble in finding useful projects to support.

Have there been notable cooperative efforts among federal and nonfederal research programs?

The whole history of NIH reflects remarkable cooperation with private foundations, voluntary health associations, scientific institutions and professional organizations. There have been very close relationships over the years between the American Cancer Society, for example, and the National Cancer Institute, between the American Heart Association and the National Heart Institute, and the endocrine so-

cieties and the National Institute of Arthritis and Metabolic Diseases. But the most striking evidence of cooperative effort is that almost all the work of the NIH, with the exception of the intramural program, is done through the private sector.

One must remember that the impact of research and research training on both education and service has always been the greatest determinant of the nature of the practice of medicine. A breakthrough such as penicillin dramatically changes the way in which medicine is practiced. In the same way, patient monitors in intensive care units are the reasons we have ICUs, not the other way around, Hence, there is a need for cooperative liaison with providers of service and research efforts that are joint ventures between federal and nonfederal agencies.

NIH is conducting clinical research in which patients are involved. Do some of these projects result in new organizational and administrative arrangements within institutions?

Yes, without question. Throughout the United States there are some 94 general clinical research units involving patients in geographically identifiable areas of hospitals. These units have a number of fall-out advantages, among them, for example, exceptional training possibilities for a whole array of personnel who make up the hospital team, ranging from specialized techniques for diet preparation, to nursing, to the training of interns and residents. These units have made contributions far above their research contributions, the reason for their being. They also create problems, of course, because they are different from other areas or departments of the hospital. It simply is impossible to introduce radical change in a round-the-clock operation without creating problems.

In clinical research you see opportunities for better design and for better care in a group of individuals who otherwise probably would not have been in the hospital. They may be there for a long time, perhaps many months, and this raises a whole host of problems about the conditions required for their care. The experience with such patients has application in all hospitals that provide prolonged care in a protective environment where patients may not be acutely ill and are able to maintain varying degrees of physical independence. As an example, the treatment of the leukemias and lymphomas has raised conceptual problems of what is the best environment for patients with these disorders.

A corollary development resulting from the clinical research program is the exploration of how we can do a better job without keeping certain patients in hospitals. Few would argue against the need for exploration here. Also, there's the concept of the core laboratory in clinical research, bringing a different order of exactness in the matter of tests, the results of which are of primary concern in research but, because of their superiority, have also been of value to the hospital as a whole.

A criticism made last year of NIH support of medical education was that this support didn't increase the number of physicians. Is this criticism valid?

I agree with the national concern about the number of physicians. But one certainly should not expect that dollars provided for the conduct of research and for postgraduate training in research will solve all of our manpower problems. On the other hand, when it comes to support for education, it is very important that the federal government make its position quite clear on what it expects for its investment. In my view, if Congress expects that dollars assigned to education should result in greater manpower—and it seems to me that this *is* the Congressional expectation—then educational institutions should expect to be required to increase their output.

What is the relationship of the NIH program to research being conducted in other countries of the world?

In recent years there's been a decline in American-sponsored biomedical research in other countries, and the current dollar amount is relatively small, in the vicinity of $12 million. NIH has consistently required that research supported in other countries must have as a basic goal some direct benefit to the American people. This policy is not directly tied to our international relations, which are the province of the State Department. There are certain areas of the world where, either because of the unique setting, scientific environment, or particular capabilities of the scientist, we might expect to obtain information that will improve this nation's health. For example, there is a small laboratory in Africa doing work on Burkitt's lymphoma because this is a cancer that occurs with greater frequency on that continent than here. As a result, however, we have been better able to treat those few patients with the disease in this country. There's a cholera laboratory in East Pakistan that we support in part. And there are other examples of facilities in various parts of the world in which we have a role.

One last question. In your opinion, is the program of the National Institutes aimed at all of the nation's serious health problems? What more do you think needs to be done on a federal level to combat disease through research?

I have no doubt that we are headed in the right direction. Almost every medical advance in this country in recent years has been supported to some degree by NIH. And the dollars have been placed where they count most—in cardiovascular diseases, cancer, arthritis and metabolic diseases, neurological diseases, allergy and infectious diseases, dental diseases, and the problems of child health and human devolpment. We've extended support to research training, institutions and special resources.

There may never be enough money or trained manpower to do all that we would like to do. Our program is vast. It encompasses all of the major health problems of our time. Now, more than ever before, I feel that the NIH program will bring our greatest potentials to bear on health problems that deserve the nation's highest priority. ■

MARSTON

To say that I am delighted to welcome you here this afternoon would be a pallid and conventional comment on what is to me a highly significant and pleasurable event. The opportunity seldom comes to a person, so soon after his appointment to office, to participate in such a significant event: The creation of a new Institute devoted to the well-being, health, and productivity of -- not just a limited section of society, or of a particular class of less fortunate people -- but of mankind at large.

It is seldom, also, that a career official has the opportunity to introduce a man who, through a long succession of years, (34, I believe) mostly as a career official himself and finally as a cabinet member, has done so much to promote that same well-being, health and welfare of all sections of our national community.

This occasion provides for me a still further delight: for once, I do not have to explain what is meant by the term "environmental health," or to expound the essential role of science in providing the knowledge on which a sound and successful program of action can be based. In welcoming you to this gathering I am, in fact, welcoming the world of environmental health and the world of science. For you here present constitute those worlds, and would find any exposition of mine as inadequate as it would be superfluous.

Were I to recognize all of the eminent persons in this audience, I fear we would be a long time coming to the purpose of this gathering.

Dr. Marston's speech at the ceremony to recognize the establishment of the NIEHS, January 12, 1969. Meeting held at the NLM.

I cannot let the opportunity pass, however, without indicating Mr. C. C. Johnson, Administrator of the Consumer Protection and Environmental Health Service, with whom, of course, we share common cause. In a very short space of time he has imparted to the several environmental control programs his own sense of urgency, direction, and decision. In the pursuit of our common cause, he has already established with the program that today becomes a National Institute, not only complete agreement on relative roles, but an active and effective collaboration at all levels of operation. We look forward to many years of enjoyable and productive cooperation.

I realize full well the competition that we were up against in scheduling this occasion for this particular afternoon. The other "super bowl" has undoubted attractions, but what we are initiating this afternoon will have profound implications for society long after today's gridiron events have been forgotten. I say, the <u>other</u> superbowl, and the analogy is not so far-fetched. For in seeking the causes, and ultimately the remedies, of the undesirable effects of man's activities, we enter upon the final and decisive contest between man and his environment. The activities of this Institute will do much to decide whether the battle will be won or lost.

I've held three jobs in Wilbur Cohen's tenure + 2X on public occasions sought to express my personal respect + admiration for this man who is so dedicated to do all he can for people

It hardly seems necessary for me to elaborate to this audience on the record of our distinguished guest, which is already very well known to most of you. For those who may have come more lately to the scene of the Department of Health, Education, and Welfare, I can scarcely do better than quote from the Congressional Record at the time of Mr. Cohen's

nomination to the post of Secretary. In the words of Senator Ribicoff:

"He was no newcomer to Government, having begun his career as a young man as research assistant to the Executive Director of President Roosevelt's Cabinet Committee on Economic Security. That committee drafted the original Social Security Act in 1934-35. Over the next 20 years he was closely associated with the development of every major piece of social security and welfare legislation which was enacted.

Former Senator Paul Douglas once said:

'A Social Security expert is a man with Wilbur Cohen's telephone number.'

But Wilbur's active mind and creative abilities could not be confined just to social security. As Assistant Secretary for Legislation, he became involved in the broad range of the Department of Health, Education, and Welfare legislative activities. No longer limited to social security and welfare, he turned his innovative talents and boundless energy to the problems of education, poverty, mental health, water and air pollution, health manpower, child health and rehabilitation."

"While he is well known as an architect of medicare, and deservedly so, many are not familiar with the lending role he has played in the development of important legislation in the field of mental health and mental retardation, such as the establishment of the National Institute of Child Health and Human Development, in 1962; the Maternal and Child Health

~~and Mental Retardation Planning Amendments of 1963, the Mental Retardation Facilities, and the Community Mental Health Centers Construction Act of 1963."~~

But need I go on? Let me conclude with just one significant paragraph: from Sen. Rib.

"He has served the Nation in many capacities -- as a legislative expert, an economist, an administrator, an intellectual, a teacher, and as an adviser to Senators and Presidents, Representatives, and Governors. He is, as Theodore White described, an 'action intellectual.'"

It is with extreme pleasure and respect, therefore, that I give you the Secretary of Health, Education, and Welfare, Mr. Wilbur Cohen.

FEDERAL MEDICAL RESEARCH
PROGRAMS IN TRANSITION*

(Notes)

Robert Q. Marston, M.D.**

Dean Ebert, Ladies and Gentlemen:

I am pleased to participate in this program on the role of the Government and the university in research. This is a most timely topic, with important implications for the field of medicine. Quite frankly, though, I wish I were giving this talk tomorrow night, or even a week or two from now. I had thought that the President's Budget for 1970 would have been released by this time, and that perhaps other information would have been available, permitting us to focus more crisply on our subject tonight and giving us another point in some of the trends for the near future. Tonight I shall restrict my comments to the subject of biomedical science and to programs of the Bureau of Professional Education and Manpower Training and the Library of Medicine, which will have a considerable impact on institutions involved in research.

In preparing briefing materials for the new administration, we have found it convenient to speak in terms of the legislative base, in terms of budget, and in terms of organization. For these tend to be the major bureaucratic devices for implementation of programs and for the resolution

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*Harvard Medical Society, Boston, Massachusetts, January 14, 1969.

**Director, National Institutes of Health, U.S. Department of Health, Education, and Welfare.

of issues. Let me speak selectively in these three areas, leading to considerations of some of the major issues which I feel are facing or will be facing the Government and the universities in the near future.

A major change in the National Institutes of Health occurred as a result of the reorganization of last April. The FIRST SLIDE shows the h health functions of the Department of Health, Education, and Welfare. There are three agencies: The Consumer Protection and Environmental Health Service; the Health Services and Mental Health Administration, and the National Institutes of Health. Within the enlarged National Institutes of Health, there are the traditional National Institutes. Since this past Sunday, when the Division of Environmental Health Sciences was elevated to the stature of an Institute, they have numbered ten.

You will note that two programs previously a part of NIH in the past, the National Institute of Mental Health and the Regional Medical Programs, are no longer here. ...We are currently seeking a Director for the Eye Institute. ...The National Institute of Neurological Diseases and Blindness was changed by the last congress to the National Institute of Neurological Diseases and Stroke, and the Fogarty International Center for Advanced Study in the Health Sciences is now getting under way. ...The Lister Hill National Center for Biomedical Communications was established by this past Congress, as part of the Library of Medicine, and you will note that in the Bureau of Health Professions Education and Manpower Training an institutional focus was established under a Deputy Director. This organization was formalized in the Federal Register on January 4, 1969.

The National Institutes of Health is constituted now to carry out the broad mission of support of research, research training, education in the health fields, and biomedical communication. The assumption is that through this transformation a better job can be done--in part, as the NIH is now better aligned with, for instance, the organization of medical schools, with its common concern for medical manpower research and the preservation and communication of scientific knowledge.

If we turn now to the problem of budget, I think we can speak of two main problems for 1969. First, the problem of absolute dollars, and second, the problem of reasonable advance assurance of the level of support to be anticipated. We are keenly aware of the increased sensitivies occasioned by the necessity to renegotiate our moral commitments for continuation awards. And as we review some figures over recent years, it will be clear that predictability is a more desirable feature when budgets are constrained than when they are growing rapidly.

The NEXT SLIDE (2) shows a profile of NIH appropriations from fiscal year 1955 to 1968. Federal support for biomedical research entered a new growth phase after the conclusion of the Korean war. The major growth has indeed been in the support of research through grants, but major additional dollars have also gone into the development of resources, into collaborative studies, and of course in direct research.

Actual obligations by dollars for 1968 and estimated obligations for 1969 are shown in the NEXT SLIDE (3).

If one looks at trends in the dollar value of NIH research grants, as shown in the NEXT SLIDE (4), there is seen to have been an increase since 1963-1964. One has to be cautious in making this point, however, because the numbers of grants--shown in the NEXT SLIDE (5)--have remained fairly constant over the past five years. This reflects, of course, the fact that the average dollar value of NIH research grants has increased, as we see in the NEXT SLIDE (6). While I cannot specify the particular reasons for this, it is clear that inflation and increased sophistication of research are two factors.

Similarly the number of NIH training grants (NEXT SLIDE, 7) has remained almost constant since 1963, although here again, the dollar value (NEXT SLIDE, 8) of NIH training grants has increased until recently, and the average dollar value per training grant (NEXT SLIDE, 9) has also shown some increase.

#573

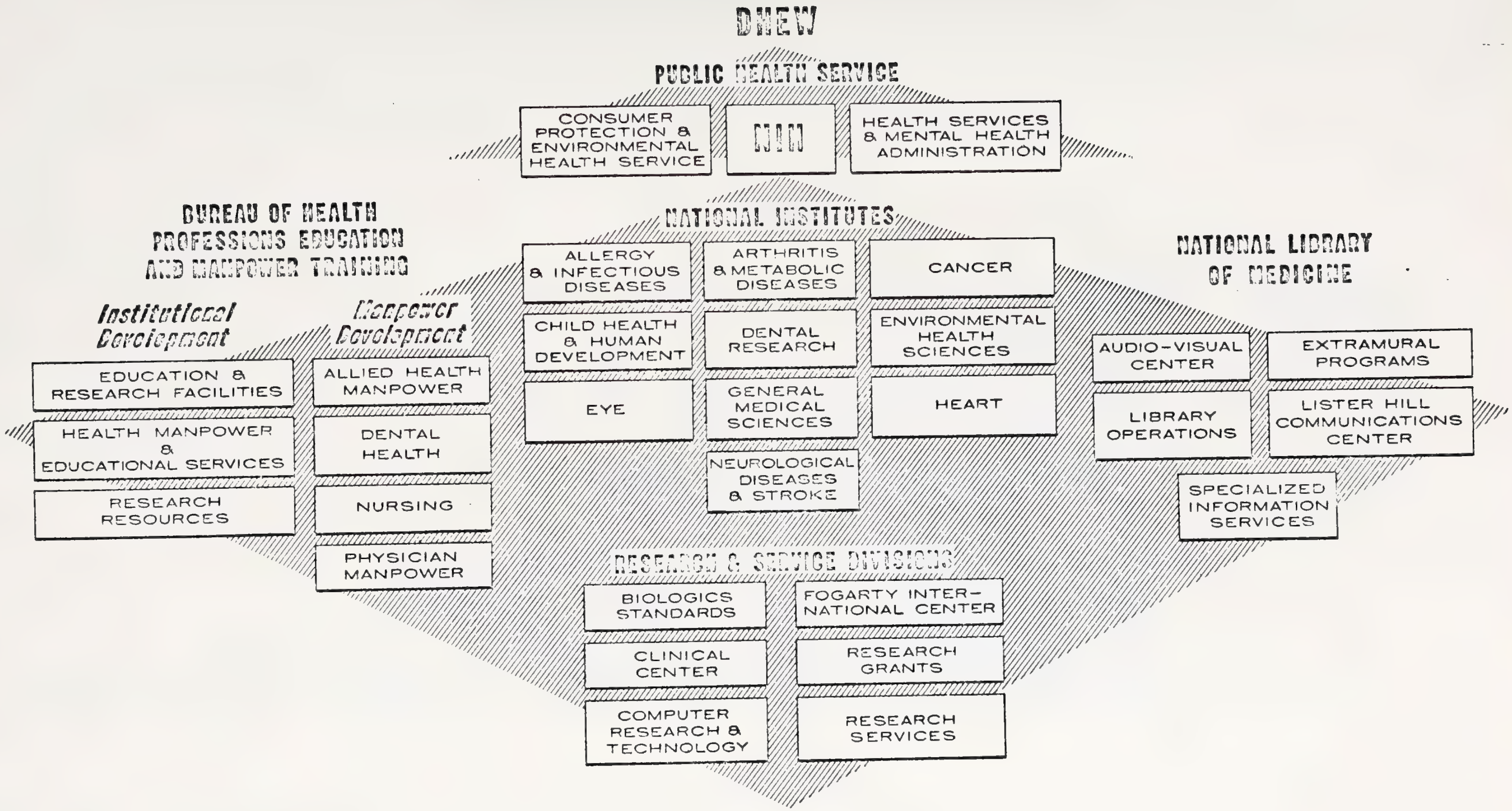
HARVARD MEDICAL SOCIETY

Boston, Massachusetts January 14, 1969

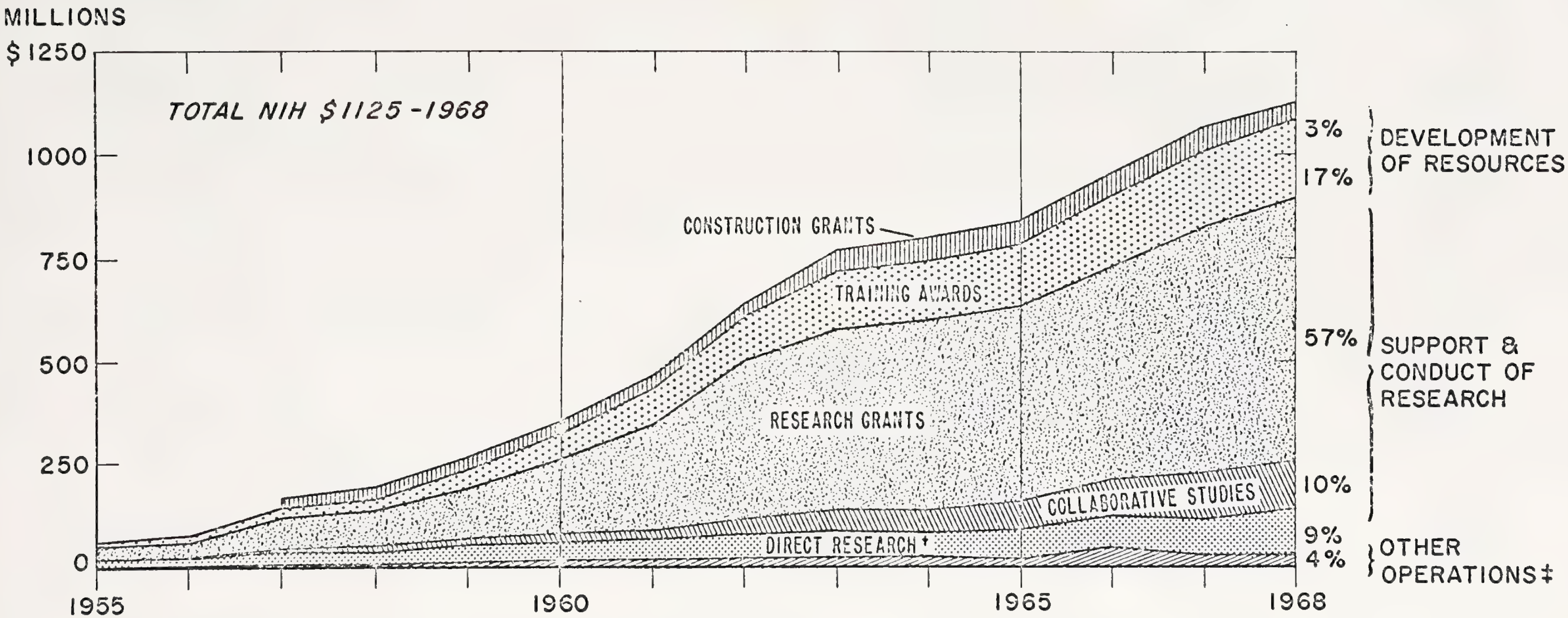
Meeting on "The Role of Government and the University in Research." Dr. Marston's topic was "Federal Medical Research Programs in Transition."

<u>Order of appearance</u>:

	<u>Title</u>
#1	Newest organization of NIH (showing NIH in three categories, the latest change is Bureau of Health Professions Education and Manpower Training (BHPEMT)). (#96)
2	Consolidated NIH Appropriations, 1955-1968, excluding programs that have been transferred out. (#55)
3	National Institutes of Health, obligations by function - 1968, 1969 (#51)
4	Dollar Value of NIH Research Grants, (#81) FY 1963-1968
5	Number of NIH Research Grants, FY (#79) 1963-1968
6	Average Dollar Value of NIH Research Grants, FY 1963-1968 (#87)
7	Number of NIH Training Grants, FY 1963-1968 (#99)
8	Dollar Value of NIH Training Grants, FY 1963-1968 (#98)
9	Average Dollar Value of NIH Training Grants, FY 1963-1968 (#99)
10	Bureau of Health Professions Education and Manpower Training; Appropriation, 1965-1969 (#514)
11	Bureau of Health Professions Education and Manpower Training, Appropriation as a Percent of Authorization, 1965-1969 (#518)


DHEW
PUBLIC HEALTH SERVICE
CONSUMER PROTECTION & ENVIRONMENTAL HEALTH SERVICE
NIH
HEALTH SERVICES & MENTAL HEALTH ADMINISTRATION
BUREAU OF HEALTH PROFESSIONS EDUCATION AND MANPOWER TRAINING
Institutional Development
EDUCATION & RESEARCH FACILITIES
HEALTH MANPOWER & EDUCATIONAL SERVICES
RESEARCH RESOURCES
Manpower Development
ALLIED HEALTH MANPOWER
DENTAL HEALTH
NURSING
PHYSICIAN MANPOWER
NATIONAL INSTITUTES
ALLERGY & INFECTIOUS DISEASES
ARTHRITIS & METABOLIC DISEASES
CANCER
CHILD HEALTH & HUMAN DEVELOPMENT
DENTAL RESEARCH
ENVIRONMENTAL HEALTH SCIENCES
EYE
GENERAL MEDICAL SCIENCES
HEART
NEUROLOGICAL DISEASES & STROKE
RESEARCH & SERVICE DIVISIONS
BIOLOGICS STANDARDS
FOGARTY INTER-NATIONAL CENTER
CLINICAL CENTER
RESEARCH GRANTS
COMPUTER RESEARCH & TECHNOLOGY
RESEARCH SERVICES
NATIONAL LIBRARY OF MEDICINE
AUDIO-VISUAL CENTER
EXTRAMURAL PROGRAMS
LIBRARY OPERATIONS
LISTER HILL COMMUNICATIONS CENTER
SPECIALIZED INFORMATION SERVICES

CONSOLIDATED NIH APPROPRIATIONS, 1955-1968
EXCLUDING PROGRAMS THAT HAVE BEEN TRANSFERRED OUT*



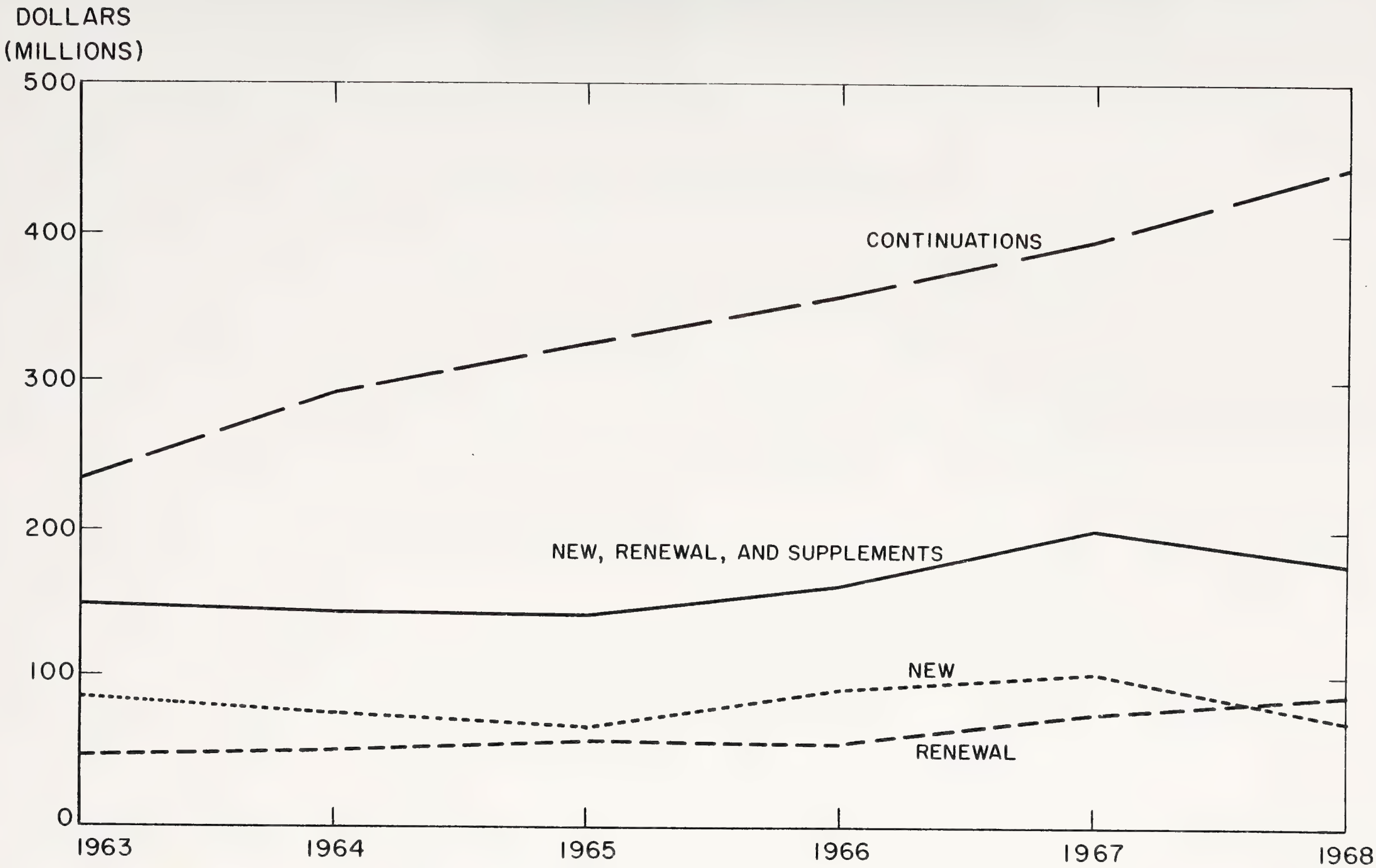
*MENTAL HEALTH, STATE CONTROL GRANTS, REGIONAL MEDICAL PROGRAMS. †EXCLUDES CONSTRUCTION. ‡BIOLOGICS CONTROL, PROFESSIONAL & TECHNICAL ASSISTANCE, DIRECT TRAINING, REVIEW & APPROVAL, PROGRAM DIRECTION.

NATIONAL INSTITUTES OF HEALTH

Obligations by Function - 1968, 1969, 1970
(in millions of dollars)

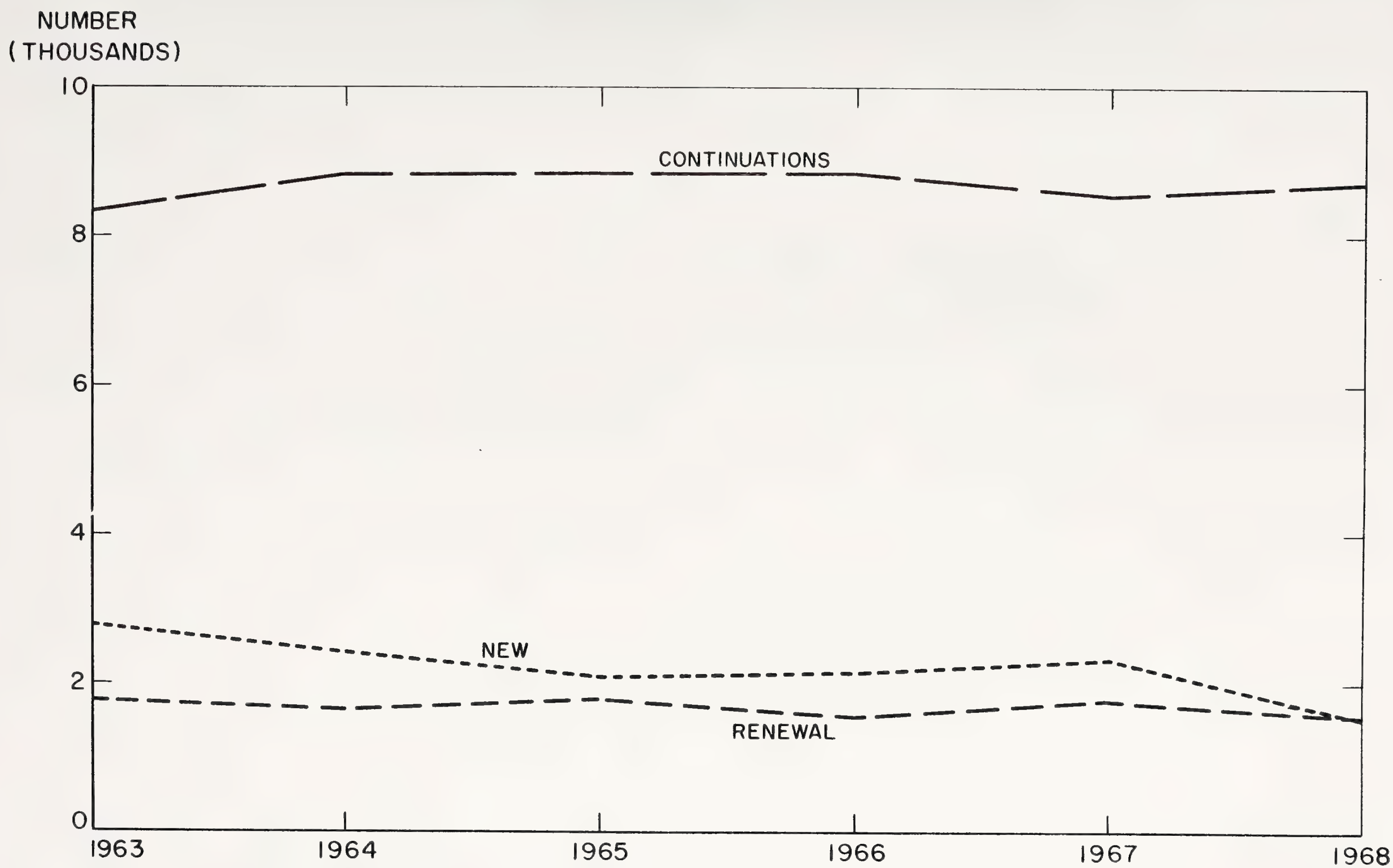
	1968 Actual obligations	1969 Estimated obligations	1970 President's Budget
TOTAL, NIH	1,462.3	1,512.7	1,546.5
Research	1,088.9	1,107.4	1,107.6
Institutional Support	158.9	146.4	130.5
Construction	38.4	20.6	--
Research Resources	120.5	125.8	130.5
Research	684.8	698.9	721.5
Grants	506.7	504.1	516.5
Direct	178.1	194.8	204.9
Research Training Awards	184.2	194.9	187.4
Other Direct Operations	60.9	67.3	68.3
Health Manpower	342.0	369.1	409.3
Institutional Development	240.3	245.4	274.9
Construction	172.0	152.0	151.0
Other	68.3	93.4	123.9
Student Assistance	80.5	97.6	104.9
Other	21.3	26.0	29.5
Medical Libraries	27.1	21.4	22.9
Institutional Support	16.8	8.9	7.6
Construction	10.0	1.3	--
Other Grants	6.8	7.7	7.6
Direct Operations	10.3	12.5	15.3
Buildings and Facilities	4.3	14.8	6.7

DOLLAR VALUE OF NIH RESEARCH GRANTS
FY 1963-1968



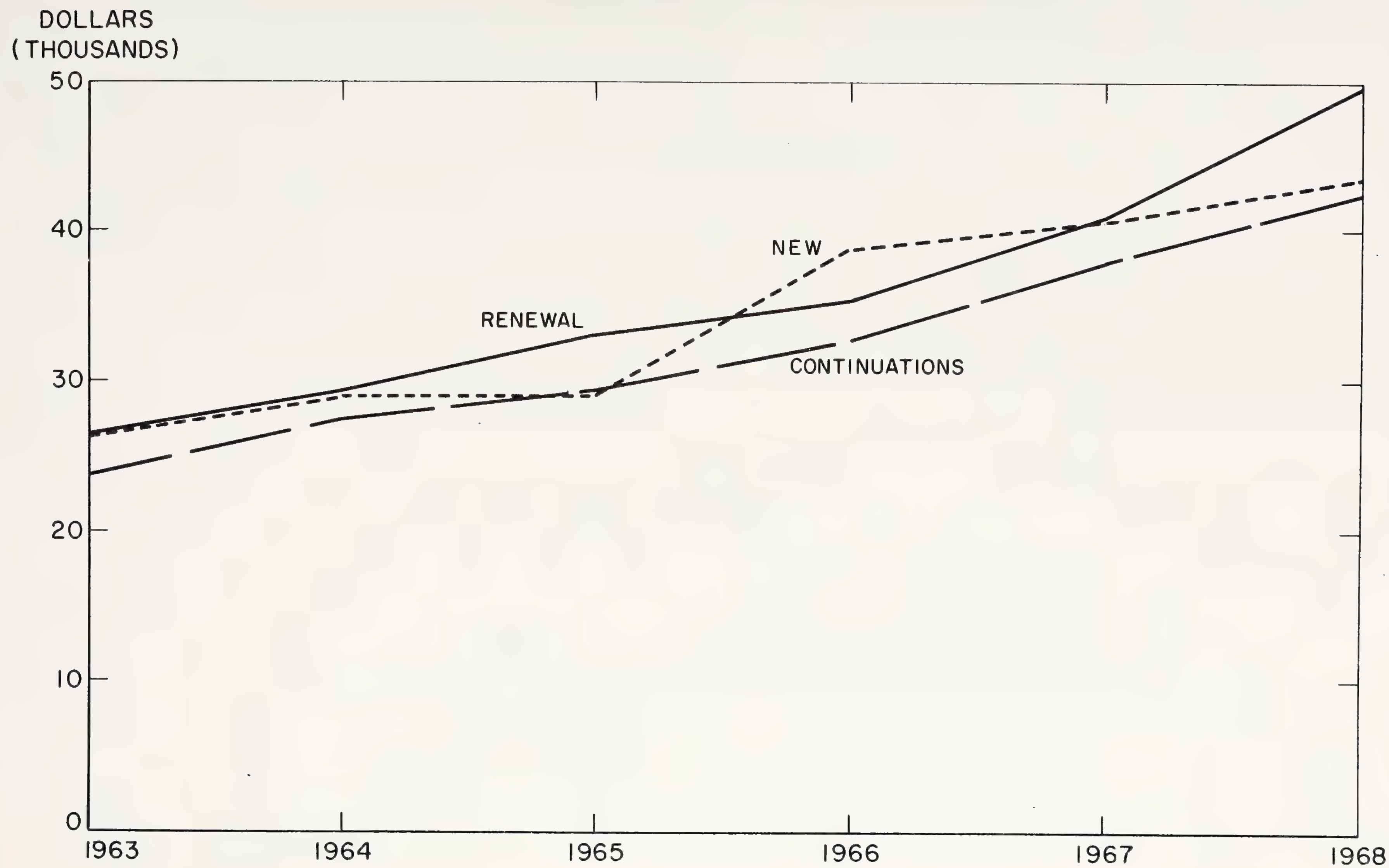
EXCLUDES NIMH, BHM AND NLM.

NUMBER OF NIH RESEARCH GRANTS
FY 1963-1968



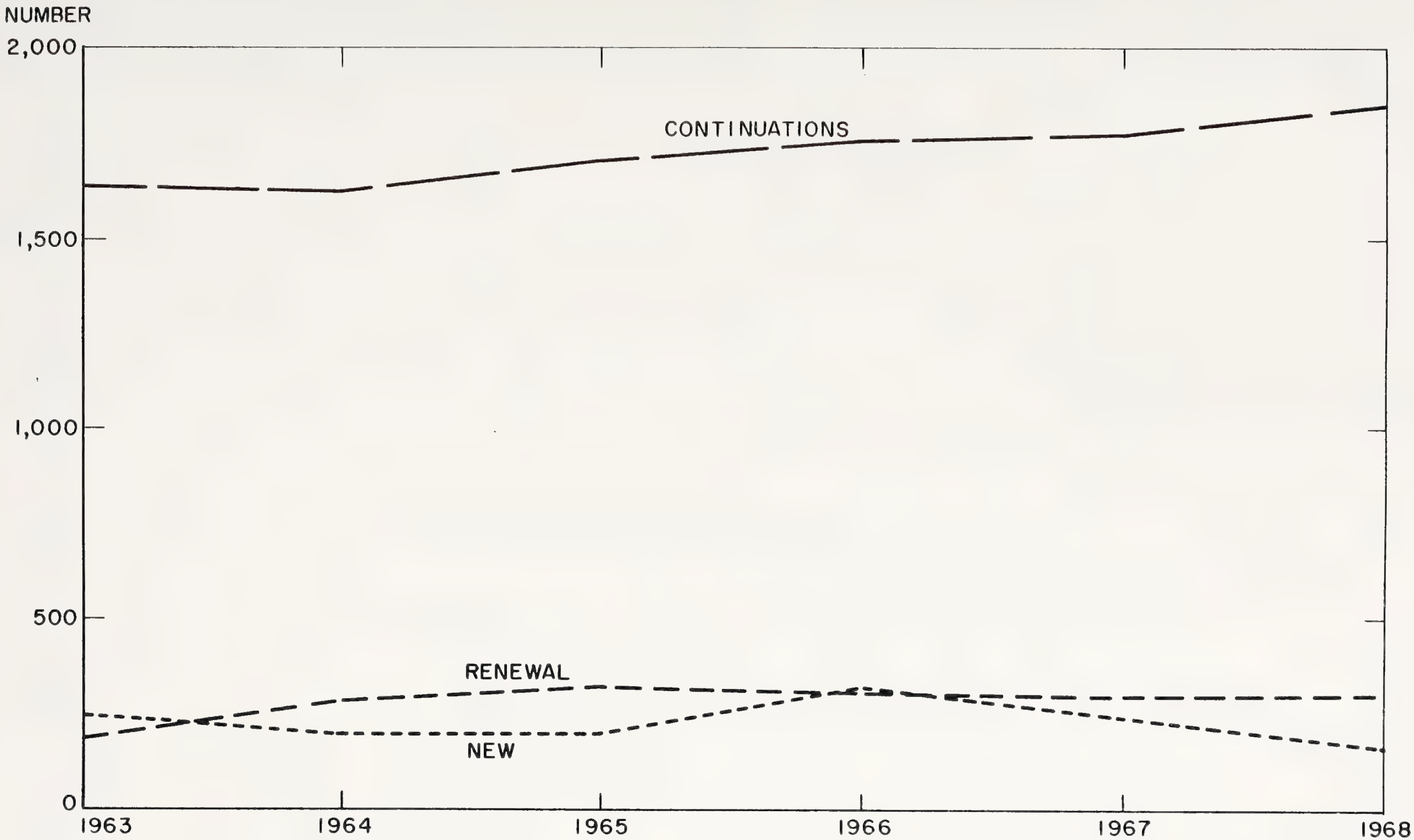
EXCLUDES NIMH, BHM AND NLM.

AVERAGE DOLLAR VALUE OF NIH RESEARCH GRANTS
FY 1963-1968



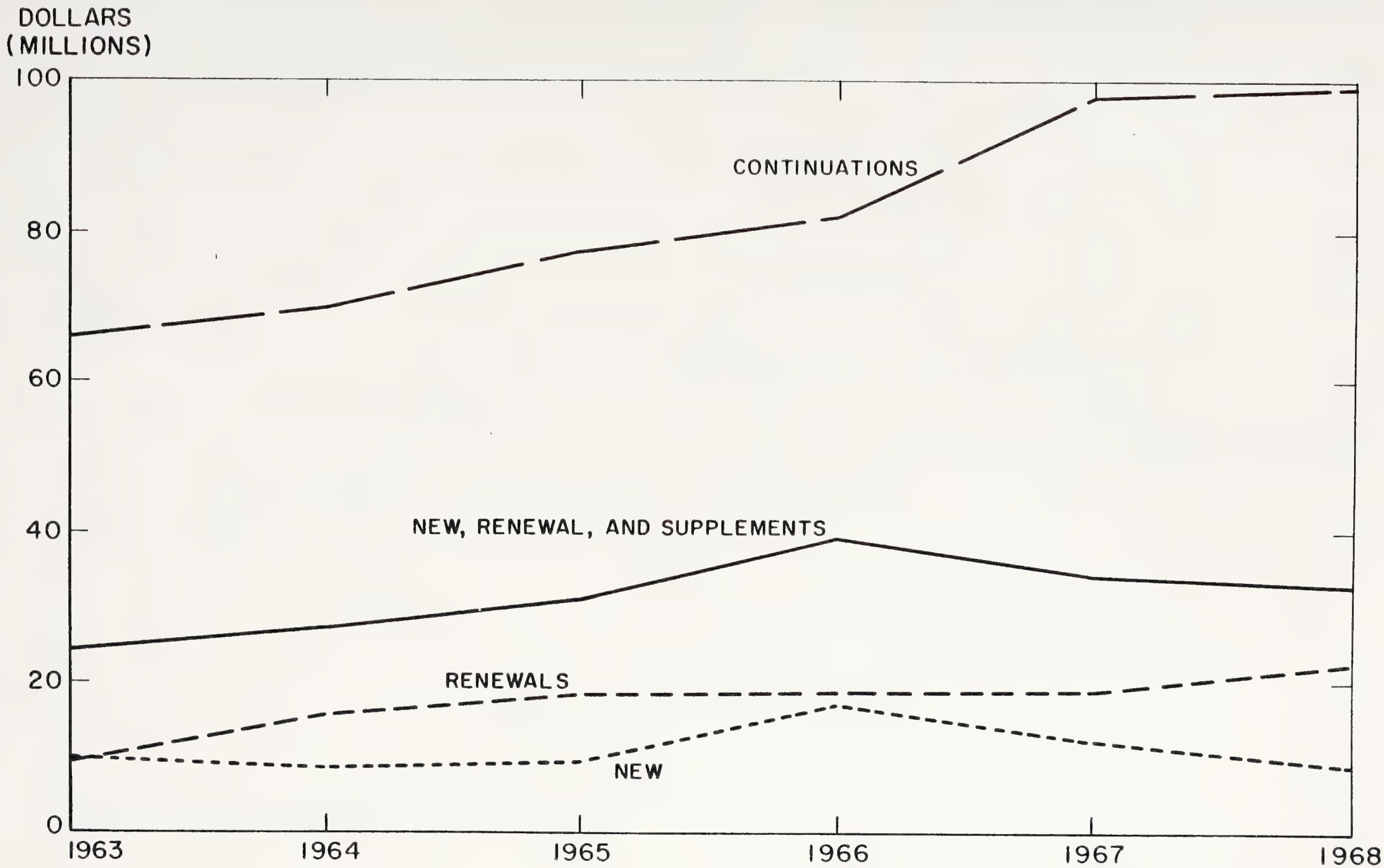
EXCLUDE NIMH, BHM AND NLM.

NUMBER OF NIH TRAINING GRANTS
FY 1963-1968



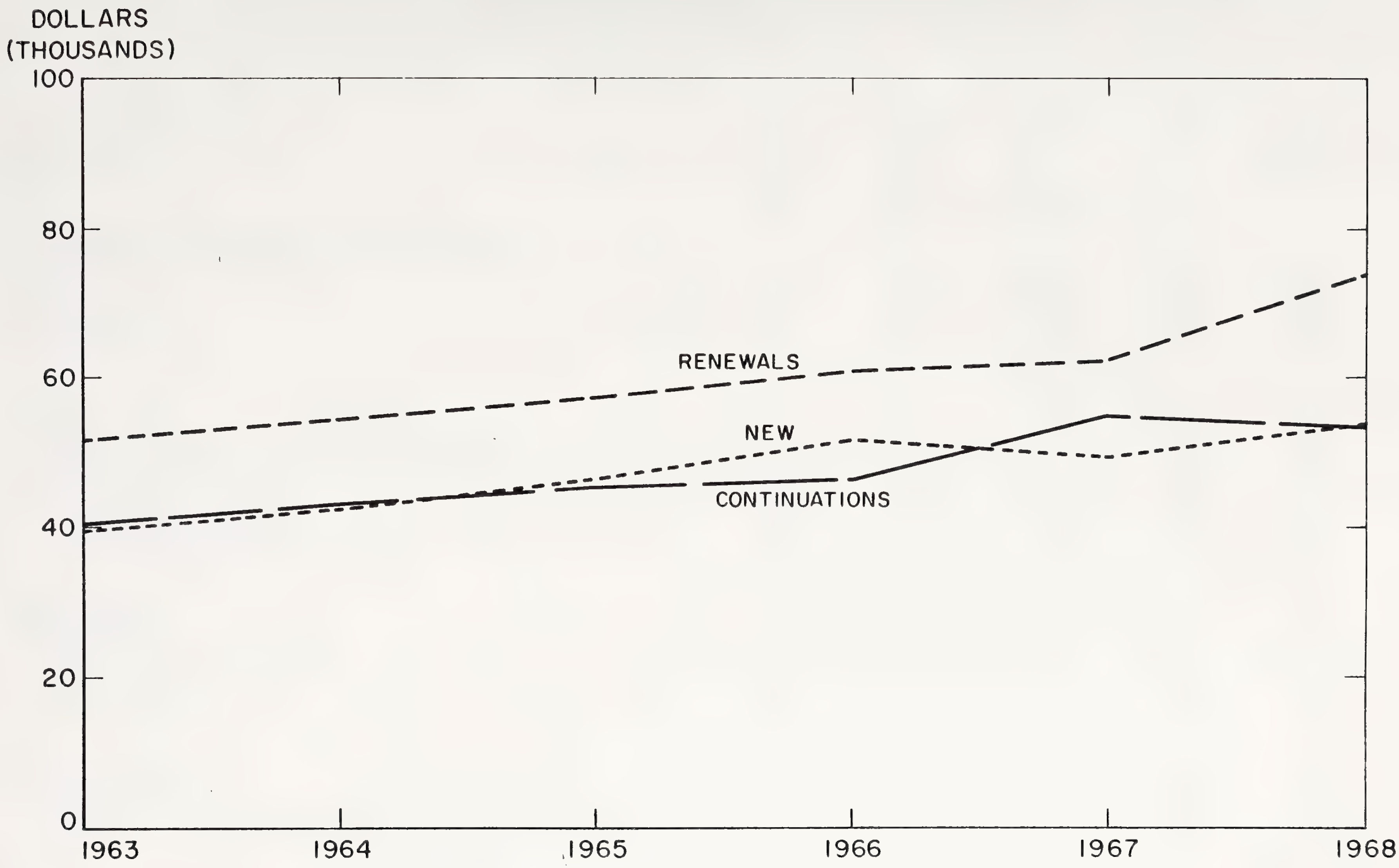
EXCLUDES NIMH, BHM AND NLM.

DOLLAR VALUE OF NIH TRAINING GRANTS
FY 1963-1968



EXCLUDES NIMH, BHM AND NLM.

AVERAGE DOLLAR VALUE OF NIH TRAINING GRANTS
FY 1963-1968



EXCLUDES NIMH, BHM AND NLM.

BUREAU OF HEALTH PROFESSIONS EDUCATION AND MANPOWER TRAINING

Appropriations, 1965 - 1969
(in millions of dollars)

	1965	1966	1967	1968	1969
TOTAL	136.8	154.0	277.3	344.5	240.7
Health Professions Educational Assistance					
Educational Improvement	--	10.5	30.0	52.5	66.0
Loans	10.2	15.4	25.3	15.0	15.0
Scholarships	--	.2	4.0	7.2	11.2
Construction	100.0	75.0	135.0	175.0	75.0
Nurses					
Construction	--	15.0	25.0	25.0	8.0
Payment to Diploma Schools of Nursing	4.0	2.5	6.0	3.0	3.0
Project Grants for Improvement of Nurses Training	2.0	3.0	4.0	4.0	4.0
Nursing Traineeships	8.0	9.0	10.0	10.0	10.5
Nurses Educational Opportunity Grants	--	--	.5	5.0	6.5
Nurses Student Loans	3.1	8.9	16.9	16.0	9.6
Allied Health					
Construction	--	--	0.0	3.0	1.8
Educational Improvement	--	--	3.3	9.8	9.8
Traineeships	--	--	.3	1.5	1.6
New Methods Grants	--	--	.2	1.0	1.2
Public Health					
Traineeships	4.5	7.0	8.0	8.0	8.0
Project Grants for Graduate Public Health Training	2.5	4.0	5.0	4.5	4.9
Grants to Schools of Public Health	2.5	3.5	3.8	4.0	4.6

BUREAU OF HEALTH PROFESSIONS EDUCATION AND MANPOWER TRAINING

Appropriation as a Percent of Authorization
1965 - 1969

	1965	1966	1967	1968	1969
TOTAL	100.0	91.0	91.8	86.1	56.3
Health Professions Educational Assistance					
Educational Improvement	--	52.5	75.0	86.7	82.5
Loans	100.0	100.0	98.1	57.7	56.6
Scholarships	--	--	--	--	--
Construction	100.0	100.0	100.0	94.6	44.1
Nurses					
Construction	--	100.0	100.0	100.0	32.0
Payment to Diploma Schools of Nursing	100.0	35.7	60.0	30.0	30.0
Project Grants for Improvement of Nurses Training	100.0	100.0	100.0	100.0	100.0
Nursing Traineeships	100.0	100.0	100.0	90.9	87.3
Nurses Educational Opportunity Grants	--	--	16.7	100.0	92.9
Nurses Student Loans	100.0	100.0	100.0	63.2	31.1
Allied Health					
Construction	--	--	0.0	33.3	13.3
Educational Improvement	--	--	36.5	75.0	57.4
Traineeships	--	--	16.7	60.0	44.3
New Methods Grants	--	--	26.7	44.4	40.8
Public Health					
Traineeships	100.0	100.0	100.0	80.0	80.0
Project Grants for Graduate Public Health Training	100.0	100.0	100.0	64.3	54.6
Grants to Schools of Public Health	100.0	70.0	75.0	80.0	75.9

TAB 8

U.S. Medicine

January 15, 1969

NIH Has Broader Operational Scope

#578

By ROBERT Q. MARSTON, M.D.
Director
National Institutes of Health

Last year was a particularly active period for the National Institutes of Health, characterized by major changes in organization and broadened scope of operation and climaxed by the award to one of its scientists of the top honor for scientific achievement, the Nobel Prize.

One of the changes at NIH during 1968 affected me particularly. This was the change in leadership. After more than 13 years as director, Dr. James A. Shannon retired and I was named his successor. It was with some trepidation that I accepted this responsibility but, having an acquaintance with the NIH extending over the past 17 years, I was reassured by my familiarity with its immense resources and tremendous potential for good in the world.

It is a time of change at NIH, and in the health services of the Department of Health, Education, and Welfare, of which it is a part. In the April 1968 reorganization, the National Institutes of Health, the Bureau of Health Manpower and the National Library of Medicine were combined to form a new agency—the new NIH—and subsequently the Division of Regional Medical Programs was transferred from the NIH to the Health Services and Mental Health Administration.

One of the principal purposes of the reorganization was to bring the closely related responsibilities for health research and health education together in a single agency.

Until now, NIH has, by Congressional mandate, supported medical research, research training and construction of health research facilities, while the Bureau of Health Manpower, under educational assistance laws enacted by Congress, has supported basic professional education.

Manpower Act

In this context, passage of the Health Manpower Act of 1968, extending these educational assistance programs was a most significant event for NIH. The act will provide assistance for construction of new facilities and operational assistance to enable more people to be trained in existing facilities and to improve the quality of the training they receive.

For example, the Bureau of Health Manpower recently awarded a $13.8 million grant to the University of Massachusetts for construction of a new medical school at Worcester. The grant will cover construction of some 420,000 square feet of lecture halls, laboratories, student and faculty areas and a library. Completion of the first phase of the new school's construction program will allow 100 students to begin their medical education.

In July, the John E. Fogarty International Center for Advanced Study in the Health Sciences replaced the Office of International Research as the organizational unit with general responsibility for the international activities of NIH. Dedicated to international cooperation and collaboration in health, medicine and biological research, it will serve as a fitting memorial to the late Rhode Island Congressman, whose many years of devotion to the cause of human health and well-being helped to bring America to world leadership in health research.

It will include an International Conference and Seminar Program, a scholars-in-residence program, an international fellowship and exchange program, and a foreign visitor center. The new conference and scholars programs will be accommodated in an existing conference facility on NIH grounds which is being renovated and remodeled for incorporation into the center's over-all design. The center has already begun work on its new programs.

New Eye Institute

In August, Congress authorized the National Eye Institute, which will be responsible for the conduct and support of research for new treatment, cures and training relative to blinding eye diseases and visual disorders. Functions presently exercised by the National Institute of Neurological Diseases and other institutes in these areas will be transferred to the new Institute when it becomes operational.

In September, the Lister Hill National Center for Biomedical Communications was established as part of the National Library of Medicine. The center honors the Senator from Alabama for his many distinguished contributions to improved health for the American people.

Over a period of the next several years it will develop information technologies and systems to improve health education, medical research, and the delivery of health services.

In carrying out its research mission this past year, NIH conducted expansive and diversified laboratory and clinical research programs in its own facilities, and continued to give broad support to all types of biomedical investigation in medical and dental schools, universities, and other research centers throughout the country. Some representative examples of the year's research accomplishments in these programs are noted below.

U.S. MEDICINE
Vol. 5, No. 2
January 15, 1969
Pages 79 & 80

Research Accomplishments

In NIH's intramural program, investigators:

▸ Made significant contributions to the refinement of a rubella vaccine. Clinical trials with this live, attenuated virus vaccine, here and abroad, confirm that it produces about 90 per cent immunity without spreading infection to those not protected. Continued observation of the immunized children indicates the vaccine produces durable immunity. Licensing of the vaccine may come within the year. A highly effective vaccine that will prevent thousands of defective babies due to rubella is anticipated before the next epidemic which, as far as can be guessed, will be in 1971 or 1972.

▸ In studying the rare "Tangier Disease," discovered some of the secrets of how fats are transported in the blood. These clues are vitally important because some abnormality in the way blood transports fat is one of the causes of arteriosclerosis, a disease that causes more than twice as many deaths as any other disease.

▸ Developed a biventricular cardiac assister which, while still in the experimental stage, could prove to be a valuable emergency room tool. The rubbery bulb-like device is fitted around a failing heart and massages it for minutes or even hours until normal rhythm can be restored.

▸ Isolated a new thyroid hormone—thyrocalcitonin—that promises to be important in treating several bone-destroying diseases. Apparently its job is to regulate the calcium level in the body and blood and to prevent human bones from softening because of insufficient calcium.

▸ Developed an artificial lung that may help doctors save the lives of babies who struggle to breathe at birth. It was designed primarily for the premature baby suffering from respiratory distress syndrome, or others with severe heart defects. It is hoped that infants with defective hearts can be kept alive on the lung long enough to enable them to withstand the strain of anesthesia and corrective surgery.

In the extramural program, NIH-supported scientists:

▸ At the University of Utah successfully tested two prototypes of an inexpensive artificial kidney machine, costing about $600, that can replace machines costing up to $10,000. Research for mass production of the machine continues; treatment could be made available to thousands who could not afford repeated trips to the hospital for treatment on conventional machines.

▸ At Cornell University produced the first completely synthetic antibiotic, Terramycin, through a method that may lead to the manufacture of drugs tailored to combat specific infections. The molecular engineering process can now be applied to the production of other compounds.

▸ At Cleveland's University Medical Center have perfected a relatively safe technique for relieving severe pain, such as that from cancer or arthritis. The technique, called cordotomy, involves cutting into the spinal cord and locating and destroying the nerve fibres that transmit pain impulses. An electrode contained in a small-bore needle is guided to the pain-carrying nerves, where a small and harmless shock helps the surgeons locate the responsible nerve. This is followed by a more powerful shock that kills a portion of that nerve.

NIH NOBEL WINNER Marshall W. Nirenberg, Ph.D.

▸ At the University of Illinois developed the first method of observing evolution under artificial conditions. This is not only of great theoretical value in understanding the underlying chemical mechanisms of heredity, but also suggests a new approach to curing viral diseases by making the viruses incapable of infecting cells.

▸ At Johns Hopkins University produced a small, wristwatch-like sensor that detects subtle danger signals in breathing patterns by measuring automatically through the intact skin the amount of carbon dioxide in a patient's bloodstream. The device has the potential to reduce substantially the mortality rate from acute respiratory syndrome and emphysema.

Programmatic Accomplishments

There was also extensive activity during the year in the federally initiated research programs sponsored by NIH. These programs identify specific goals for the direct application of research knowledge to certain diseases or move to accumulate further knowledge essential to such application. Thus they provide a more effective approach to selected health problems of national importance through organized collaboration.

Typical of this activity was the progress made in the artificial heart-myocardial infarction program of the National Heart Institute. This twofold program brings biomedical research and bioengineering into conjunction against the acute heart attack.

DR. MARSTON

The artificial heart program's long-term goal is a completely implantable, permanent heart replacement. Present efforts are focused on the development of three types of devices to assist, rather than replace, the hearts of patients with acute or chronic heart failure resulting from heart attacks or other conditions. These are:

- Emergency-assist devices, designed to sustain life in victims of heart attacks or other circulatory crises until the patient could be brought to the hospital for definitive treatment.

- Temporary-assist devices, capable of providing circulatory assistance for days or even weeks.

- Permanent-assist devices, for victims who survive heart attacks but are permanently disabled, designed to restore such patients to useful, productive lives.

Development of emergency-assist and temporary-assist devices is well along, several of both types having shown considerable promise in limited clinical trials. Problems related to permanent-assist devices are more serious and at present largely unsolved.

Artificial Heart Program

In August the artificial heart program announced the award of 51 new research contracts and the extension of 48 others for studies basic to the development of these devices. It has now made a total of 124 awards in this field since its inception in June 1964.

The myocardial infarction branch of the AH-MI program, which came into being in 1966, administers a national program of biomedical research aimed at reducing death and disability from acute heart attacks. Its work complements the activities of the artificial heart branch and provides an essential base of medical knowledge for continued development and evaluation of circulatory assist devices.

Through its myocardial infarction research unit (MIRU) program, this branch seeks a better understanding of acute heart attacks and more effective means of treatment.

Each MIRU is a clinical unit located within the patient-care area of the hospital, specially equipped and staffed for comprehensive care and detailed study of heart-attack patients during the acute phase of their illness. Its clinical activities are supplemented by extensive laboratory research and experimental studies in animals, the latter permitting far more detailed observations than are presently possible in patients and also extensive testing of new drugs or other therapeutic measures.

During the year, the MI branch sponsored establishment of MIRUs at four major medical centers: the University of California, San Diego; Cedars-Sinai Medical Center, Los Angeles; the University of Chicago; and the University of Rochester. In addition, support was continued for MIRUs previously established at the University of Alabama, Cornell, Duke, Johns Hopkins, and Massachusetts General Hospital.

Cancer Research

Another programmed activity, the cancer chemotherapy program of the National Cancer Institute, significantly increased the potential for drug control of cancer during 1968. This program, established in 1955, had already achieved complete remission of disease for extended periods of time in acute leukemia, some childhood solid tumors, Hodgkin's disease, choriocarcinoma, Burkitt's lymphoma, and testicular tumors.

Measurable advances were made toward revealing some principles underlying selective toxicity of drugs for cancer cells. It appeared to be increasingly possible to set up timetables for drug administration that would kill tumor cells without irreparable damage to the patient's normal cells.

One development in this area came from the investigations of Dr. Howard E. Skipper of the Southern Research Institute, a member of the chemotherapy advisory committee of NCI, who made calculations of the number of tumor cells killed by drug therapy of mouse leukemia. He then showed that the same drug killed different numbers of cells depending upon the way it was administered. The principles thus elucidated have been shown to apply to patients.

Another recent development came from work done by Dr. William R. Bruce of the University of Toronto, a member of the cell kinetics group of NCI's acute leukemia task force. He showed that increasing doses of some drugs do not kill increasing fractions of normal bone marrow cells, but do destory increasing fractions of the tumor population. His work has focused attention on the life cycle of cells and the phases of that life cycle during which cells are particularly vulnerable to drugs.

Intensive courses of drug combinations, given internally, appear to have selective toxicity for leukemia cells, with the capability of reducing the leukemic cell population in children to the stage where the child has no sign of his disease and remission has been achieved. Repeated administration of these drug combinations can further reduce the leukemic cell number in some patients.

At major treatment centers today, it is possible to restore from 90 to 100 per cent of such patients to complete—although temporary—good health. Half of these patients may be expected to live at least three years and a percentage live much longer. This is an amazing achievement, when one recalls that as recently as four years ago, the complete remission rate was 50 per cent and the median length of survival only 12 to 19 months.

Equally heartening is the hope that with the application of the research developments of the last few years the less responsive tumors, such as cancer of the breast, lung, colon, prostate and kidney will become susceptible to chemotherapy.

This Year And Beyond

In the coming year, the NIH will give major emphasis to a melding of the programs of support for institutions, for construction, and for further development of the potential for improving health through the combined efforts of research, education and communication.

The plans of the NIH institutes that conduct research in their own laboratories call primarily for a continuation of current efforts in their respective areas of responsibility. Special emphasis will be given to those sectors in which emerging opportunities for more fruitful research are recognized. Their operations are so complex, however, that the space factor itself precludes a proper discussion of their specific plans for 1969.

In general, a comparable situation—continuation of current operations—will exist at NIH in institutes that support, but do not conduct, research. It might be interesting to note representative plans of some of these units, both as a guide to their operations and an indication of the direction of certain of their programs for the next year.

The National Institute of General Medical Sciences (NIGMS) will emphasize projects which will enhance and further the aims of its genetics research program, especially those which can be directly applied to clinical problems; in automated clinical laboratories program, aimed at bringing an automation capacity not only to large hospitals, but also to those smaller hospitals where significant shortages of adequate automation and critical limitations in trained personnel threaten to hamstring their operation; an increase in its support of the behavioral sciences; and development of new programs in maternal and fetal pharmacology and related areas in existing pharmacology-toxicology research centers.

Data Bank Planned

The Bureau of Health Manpower plans to establish a health manpower data bank and information clearinghouse to provide a central place for storage and retrieval of health manpower information derived from private and public sources. This kind of information is essential for planning by institutions, organizations and agencies whose responsibility it is to develop and support education for the health occupations.

The National Library of Medicine will continue development of a second-generation MEDLARS computer system; further the design and operation of a Toxicology Information Program; support the design of a health information network; and augment resources to provide services at the National Audio-Visual Center.

The Division of Research Facilities and Resources (DRFR), through its special research resources program, will continue to support some 42 computer centers, 6 analytical biochemistry instrumentation resources and 3 biomaterials and information sciences resources to enhance the nation's biomedical research capacity.

The Division of Biologics Standards (DBS) will accelerate its work on mycoplasma, whose known and suspected roles in human disease make it necessary to assure that vaccines be free of these organisms.

Finally, the Division of Computer Research and Technology (DCRT) plans collaborative efforts with several Institutes and Divisions at NIH. A project with the National Cancer Institute involving computer processing of the natural English diagnostic statements of pathology will allow testing for routine use of this computer-based system. Its long-range goal is the expansion of these mathematical and logical algorithms to process clinical discharge summaries and, ultimately, clinical records.

Summary

This brief summarization of 1968 research accomplishments and programmatic innovations at the NIH, along with a sketch of the main thrust of research support efforts, is intended as a broad assessment of NIH at the time of its acquiring a new director and shortly after it had been given an enlarged mission.

The responsibilities and opportunities ahead for the expanded NIH will increase. The coupling of the medical research capabilties of the NIH with rich biomedical communications resources and with the manpower machinery deployed to meet the problem of health manpower shortages puts the NIH in a unique position for dealing with today's most pressing problems in the health fields.

NIH RESEARCH PROGRAMS
IN TRANSITION*

(Notes)

Robert Q. Marston, M.D.**

I am delighted to have this opportunity to discuss with the Committee the extended program and goals of the National Institutes of Health. This is a most timely topic, with important implications for the biomedical sciences. Now that the President's Budget for 1970 has been released, we can focus rather crisply on our subject and make use of another point in some of the trends for the near future. ~~Today I shall restrict my comments to the subject of biomedical science and to programs of the Bureau of Professional Education and Manpower Training and the Library of Medicine, which will have a considerable impact on institutions involved in research.~~

In the preparation of briefing materials for the new administration, we have found it convenient to speak in terms of the legislative base, of budget, and of organization. These tend to be the major bureaucratic devices for the implementation of programs and the resolution of issues. Let me speak selectively in these three areas, leading up to consideration of some of the major issues which I feel are facing, or will be facing, the Government and the universities in the near future.

A major change in the National Institutes of Health occurred as a result of the reorganization of last April. The FIRST SLIDE represents the health functions of the Department of Health, Education, and Welfare.

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*Presented before the Public Affairs Committee, FASEB, January 24, 1969.

**Director, National Institutes of Health, U.S. Department of Health, Education, and Welfare.

There are three agencies: The Consumer Protection and Environmental Health Service; the Health Services and Mental Health Administration; and the National Institutes of Health. Within the enlarged NIH, there are the traditional National Institutes. Since Sunday a week ago, when the Division of Environmental Health Sciences was elevated to the stature of an Institute, they have numbered ten.

Two programs that were once a part of NIH--the National Institute of Mental Health and the Regional Medical Programs--are no longer administered by us. ...We are currently seeking a Director for the Eye Institute. ...The National Institute of Neurological Diseases and Blindness was changed by the last Congress to the National Institute of Neurological Diseases and <u>Stroke</u>. ...The Lister Hill National Center for Biomedical Communications was established by the Congress as part of the Library of Medicine, and the Fogarty International Center for Advanced Study in the Health Sciences is now getting under way. ...You will note that in the Bureau of Health Professions Education and Manpower Training, an institutional focus was established under a Deputy Director. This organization was formalized in the <u>Federal Register</u> on January 4 of this year.

The National Institutes of Health is constituted now to carry out the broad mission of support of research, research training, education in the health fields, and biomedical communication. The assumption is that through this transformation a better job can be done--in part, as the NIH is now better aligned with the organization of medical schools, with its common concern for medical manpower, research, and the preservation and communication of scientific knowledge.

Note Dart. Ber

If we turn now to the matter of budget, I think we can speak of two main problems for 1969. First, the problem of absolute dollars; and second, the problem of reasonable advance assurance of the level of support to be anticipated. We are keenly aware of the increased sensitivity occasioned by the need to renegotiate our moral commitments for continuation awards. And in reviewing some figures over recent years, we will see clearly that predictability, a desirable feature even when budgets are growing rapidly, is even more so in a period of budgetary constraint.

The NEXT SLIDE (2) shows a profile of NIH appropriations from fiscal year 1955 to 1968. Federal support for biomedical research entered a new growth phase after the conclusion of the Korean war. The major growth has indeed been in the support of research through grants, but major additional dollars have also gone into the development of resources, into collaborative studies, and of course into direct research.

Actual obligations by dollar for 1968 and estimated obligations for 1969 and 1970 are shown in the NEXT SLIDE (3).

If one looks at trends in the dollar value of NIH research grants, as shown in the NEXT SLIDE (4), there is seen to have been an increase since 1963-1964. One has to be cautious in making this point, however, because the numbers of grants--shown in the NEXT SLIDE (5)--have remained fairly constant over the past five years. This reflects, of course, the

fact--shown in the NEXT SLIDE (6)--that the average dollar value of NIH research grants has increased. While I cannot specify all the reasons for this, it is clear that inflation and increased sophistication of research have played a part.

Similarly the number of NIH training grants (NEXT SLIDE, 7) has remained almost constant since 1963, although here again, the dollar value (NEXT SLIDE, 8) of NIH training grants has increased until recently, and the average dollar value per training grant (NEXT SLIDE, 9) has also shown some increase.

Another way to look at program trends of recent years is to review the budgetary data of the Bureau of Health Professions and Education and Manpower Training. The NEXT SLIDE (10) shows appropriations for these programs since 1965. Let me point out what is on this slide and then bring you back to focus only on the top line. Here is included the Health Professions Education Assistance for medical and dental purposes, including educational improvement, loans, scholarship and construction. The orders of magnitude for 1968 are $52 million, $15 million, $7 million and $175 million. As you see, construction took a major drop in 1969.

Now if you will focus a moment on the top line--in 1965 the appropriation was approximately $137 million, and for that year the authorization was the same--$137. However, for each year starting in 1966, beginning to tighten up, fewer dollars were appropriated than were authorized. The figures were $169 million authorized for 1966, $154 million

appropriated; $302 authorized for 1967, $277 million appropriated; $400 million authorized for 1968, $344 million appropriated; and then for 1969, $427 million authorized and $241 million appropriated. The big cut, of course, was in construction, and the reasons were multiple and complex. But this is one way of dramatizing the fact that even in an area as acute and generally recognized as health manpower, it has not been possible to mobilize resources that were anticipated at the time organizations were established. This has occurred in other areas--not just at the National Institutes of Health.

I summarize the trend by showing the NEXT SLIDE (11), which gives the appropriation as a percent of authorization. We see that in 1965, essentially 100 percent was provided. In 1966 and '67, some selectivity was obvious. By 1968 there was a decided retraction; and by 1969 the full impact of constraints was seen, the differences becoming fairly marked in almost all areas.

It will be of little surprise to this audience that we anticipate continued constraints for at least the next two years. The immediate question that arises, then, so far as budget is concerned, is the degree of accuracy with which one can indeed predict available funds--first, on a short-term basis, then the probability for release in the mid- or ten-year range, and finally the prospects for the years beyond. Until one has a reasonably good estimate in general orders of magnitude, it is very difficult to make a reasonable allocation while restraining programs generally. If one visualizes a long period of major constraints, this implies a deferrment of some activity such as expansion of research

facilities, expansion of training programs, or development of those educational programs that might not require as long a term as others. Our assumption at present is that we are in a period of temporary fiscal constraint and that there will be relief in the near future.

I will turn now briefly to the legislative base for the support of the National Institutes of Health. To make only two points: We do not have major legislative changes pending for the research aspect of the National Institutes of Health. On the other hand, extensions of the basic legislations of the National Library of Medicine will come before this first session of the 91st Congress. In addition, though the Health Manpower Amendments of 1968 go into effect on July 1 of this year, the extension was for a two-year period only. We shall be forwarding legislation for these programs less than a year from now for fiscal 1970.

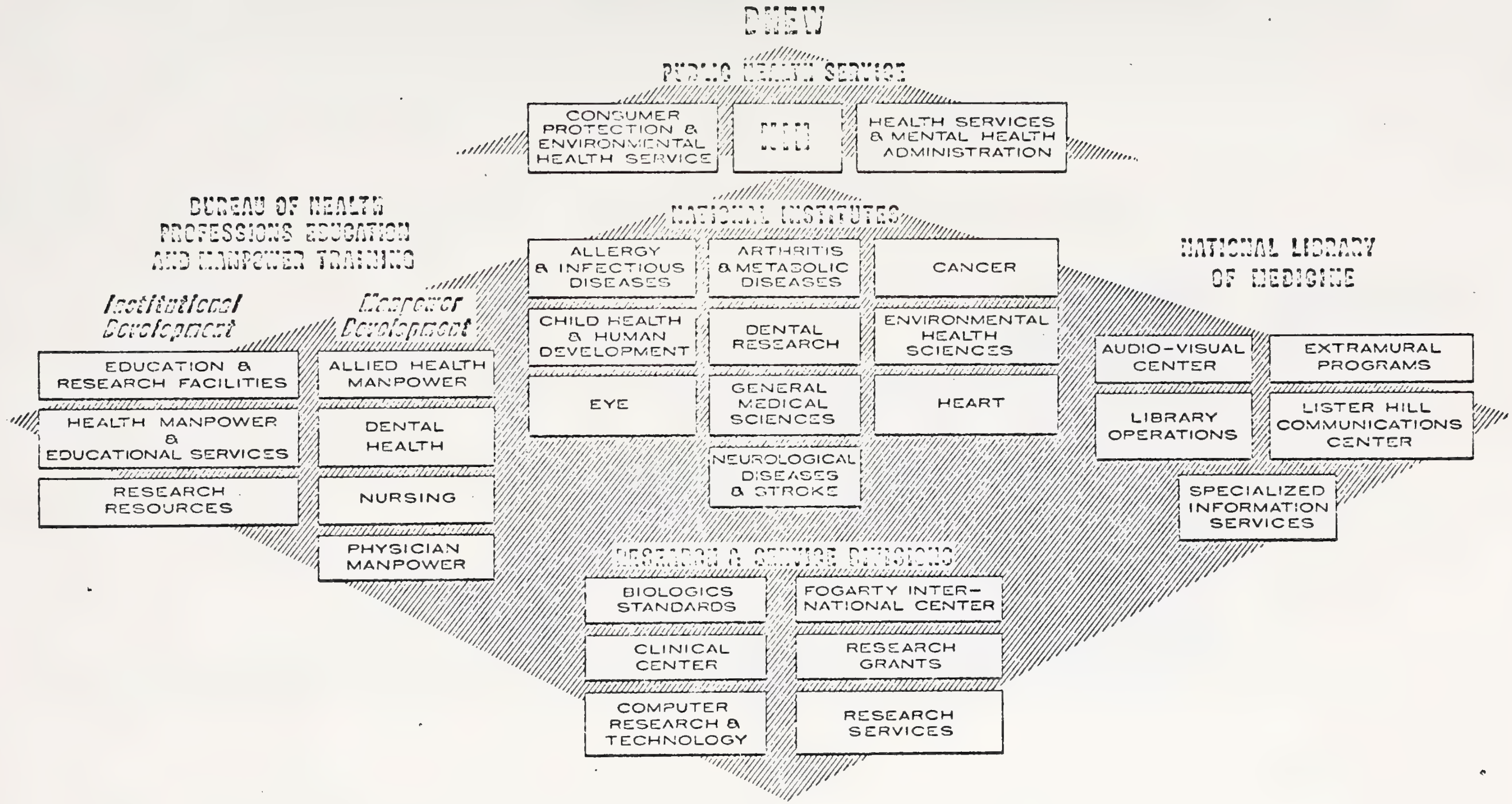
I believe that the relationship of the Federal Government to universities will be dependent to a considerable extent on our ability to emerge from this next round of health manpower legislation with a more complete articulation of national policy under these laws than has been possible to date. Now that I have touched, however, on the legislative programs of importance in the immediate future, let me speak more generally about the problems and issues facing the support of research.

First, let me assert that I believe research is suspect, to a degree that would have been unbelievable only a short time ago. For example, there is the question whether Federal support of research, in the light of today's problems arising on all sides, has indeed been harmful to education, to teachers, and to students. Then, there are some who believe that deployment

of the resources going into research could somehow bail us out of our problems in the organization and delivery of health services. One major reason that the two activities are not interchangeable is the difference in magnitude of the resources needed for each. If one looks only at dollars, the total cost of health care to the Nation is in the order of $55 to $60 billion. The portion devoted to medical research (exclusive of training and construction) is only about $2.5 billion, or 5 percent; and the Federal share of this is about two-thirds, or $1.6 billion. While we do not have good estimates of the total investment in education and training across the total health field, the figure is closer to the $2.5 billion research figure than to the $55 to $60 billion total figure. Thus, it is clear that the need for additional funds in health services cannot be met by movement of dollars out of research and education. Even a billion dollars shifted to our health service bill, though ruinous to medical research and education, would contribute little to the service problems.

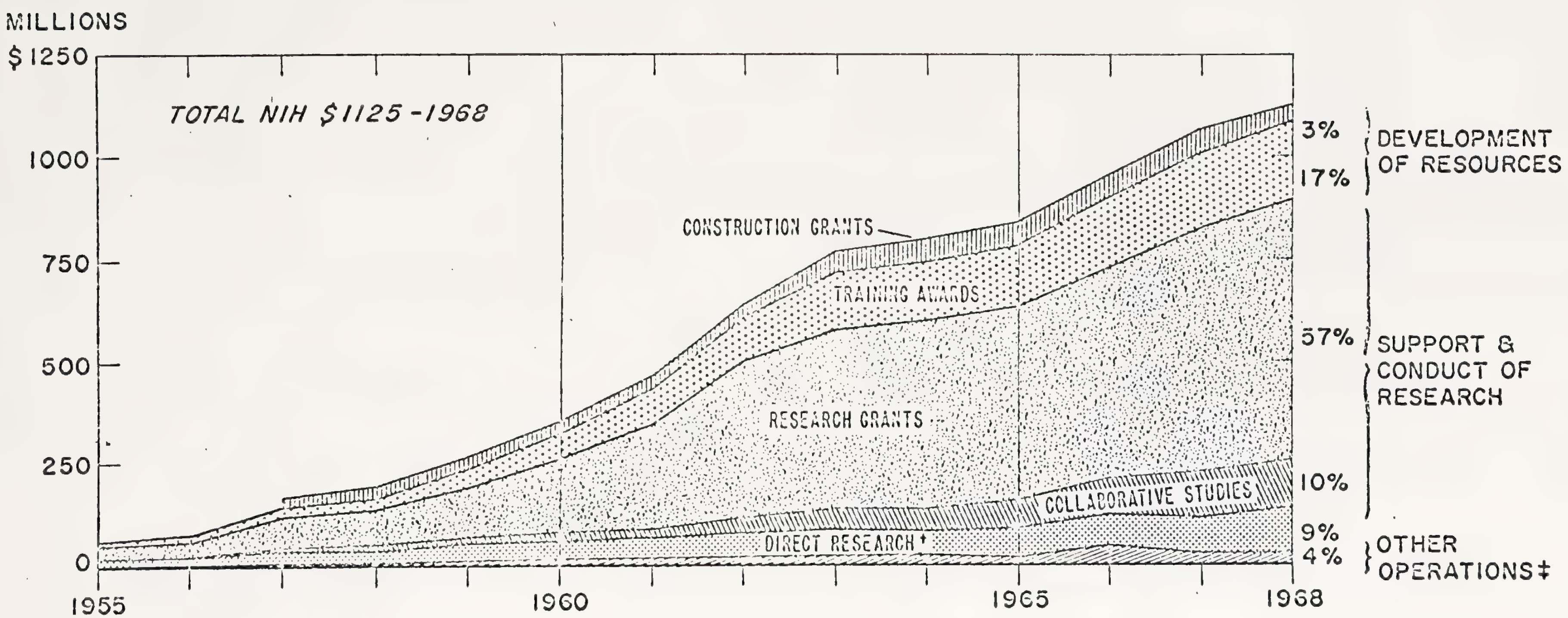
As a related and quite serious problem, there is the difficulty of communicating the nature of research to the public broadly, or even to those in decision-making positions of responsibility. This complicates the rather desperate search for some way to find an overall mechanism or process for a more reasonable allocation of national resources. My prejudice, and perhaps yours, is that the development of such a rational process would indeed improve the Federal Government's relationship and support of academic science in achieving national goals, and this is a task that we must be about.

I call your attention to the speech by Dr. Donald Hornig, Special Assistant to the President for Science and Technology, in which he reviewed the year's science policy; to Don Price's article in a recent issue of Science; and to Jim Shannon's speech "Science and Social Purpose" presented at the meeting of the AAAS in late December. Although serious though is being given to the need to develop the basic policy guidelines against which talent, manpower resources, and dollars will be deployed, it remains that we do not have such guidelines today. Meanwhile, there is work to be done. And for a program operator such as myself, it is important, while moving toward such a broad definition of national policy, to take other actions with shorter-term goals during this period of transition in Federal support of science.


DHEW
PUBLIC HEALTH SERVICE
CONSUMER PROTECTION & ENVIRONMENTAL HEALTH SERVICE
NIH
HEALTH SERVICES & MENTAL HEALTH ADMINISTRATION
BUREAU OF HEALTH PROFESSIONS EDUCATION AND MANPOWER TRAINING
Institutional Development
EDUCATION & RESEARCH FACILITIES
HEALTH MANPOWER & EDUCATIONAL SERVICES
RESEARCH RESOURCES
Manpower Development
ALLIED HEALTH MANPOWER
DENTAL HEALTH
NURSING
PHYSICIAN MANPOWER
NATIONAL INSTITUTES
ALLERGY & INFECTIOUS DISEASES
ARTHRITIS & METABOLIC DISEASES
CANCER
CHILD HEALTH & HUMAN DEVELOPMENT
DENTAL RESEARCH
ENVIRONMENTAL HEALTH SCIENCES
EYE
GENERAL MEDICAL SCIENCES
HEART
NEUROLOGICAL DISEASES & STROKE
RESEARCH & SERVICE DIVISIONS
BIOLOGICS STANDARDS
FOGARTY INTER-NATIONAL CENTER
CLINICAL CENTER
RESEARCH GRANTS
COMPUTER RESEARCH & TECHNOLOGY
RESEARCH SERVICES
NATIONAL LIBRARY OF MEDICINE
AUDIO-VISUAL CENTER
EXTRAMURAL PROGRAMS
LIBRARY OPERATIONS
LISTER HILL COMMUNICATIONS CENTER
SPECIALIZED INFORMATION SERVICES

CONSOLIDATED NIH APPROPRIATIONS, 1955-1968

EXCLUDING PROGRAMS THAT HAVE BEEN TRANSFERRED OUT*



*MENTAL HEALTH, STATE CONTROL GRANTS, REGIONAL MEDICAL PROGRAMS. †EXCLUDES CONSTRUCTION. ‡BIOLOGICS CONTROL, PROFESSIONAL & TECHNICAL ASSISTANCE, DIRECT TRAINING, REVIEW & APPROVAL, PROGRAM DIRECTION.

NATIONAL INSTITUTES OF HEALTH

Obligations by Function - 1968, 1969, 1970
(in millions of dollars)

	1968 Actual obligations	1969 Estimated obligations	1970 President's Budget
TOTAL, NIH	1,462.3	1,512.7	1,546.5
Research	1,088.9	1,107.4	1,107.6
Institutional Support	158.9	146.4	130.5
Construction	38.4	20.6	--
Research Resources	120.5	125.8	130.5
Research	684.8	698.9	721.5
Grants	506.7	504.1	516.5
Direct	178.1	194.8	204.9
Research Training Awards	184.2	194.9	187.4
Other Direct Operations	60.9	67.3	68.3
Health Manpower	342.0	369.1	409.3
Institutional Development	240.3	245.4	274.9
Construction	172.0	152.0	151.0
Other	68.3	93.4	123.9
Student Assistance	80.5	97.6	104.9
Other	21.3	26.0	29.5
Medical Libraries	27.1	21.4	22.9
Institutional Support	16.8	8.9	7.6
Construction	10.0	1.3	--
Other Grants	6.8	7.7	7.6
Direct Operations	10.3	12.5	15.3
Buildings and Facilities	4.3	14.8	6.7

CHART 2

DOLLAR VALUE OF NIH RESEARCH GRANTS

FY 1963-1968

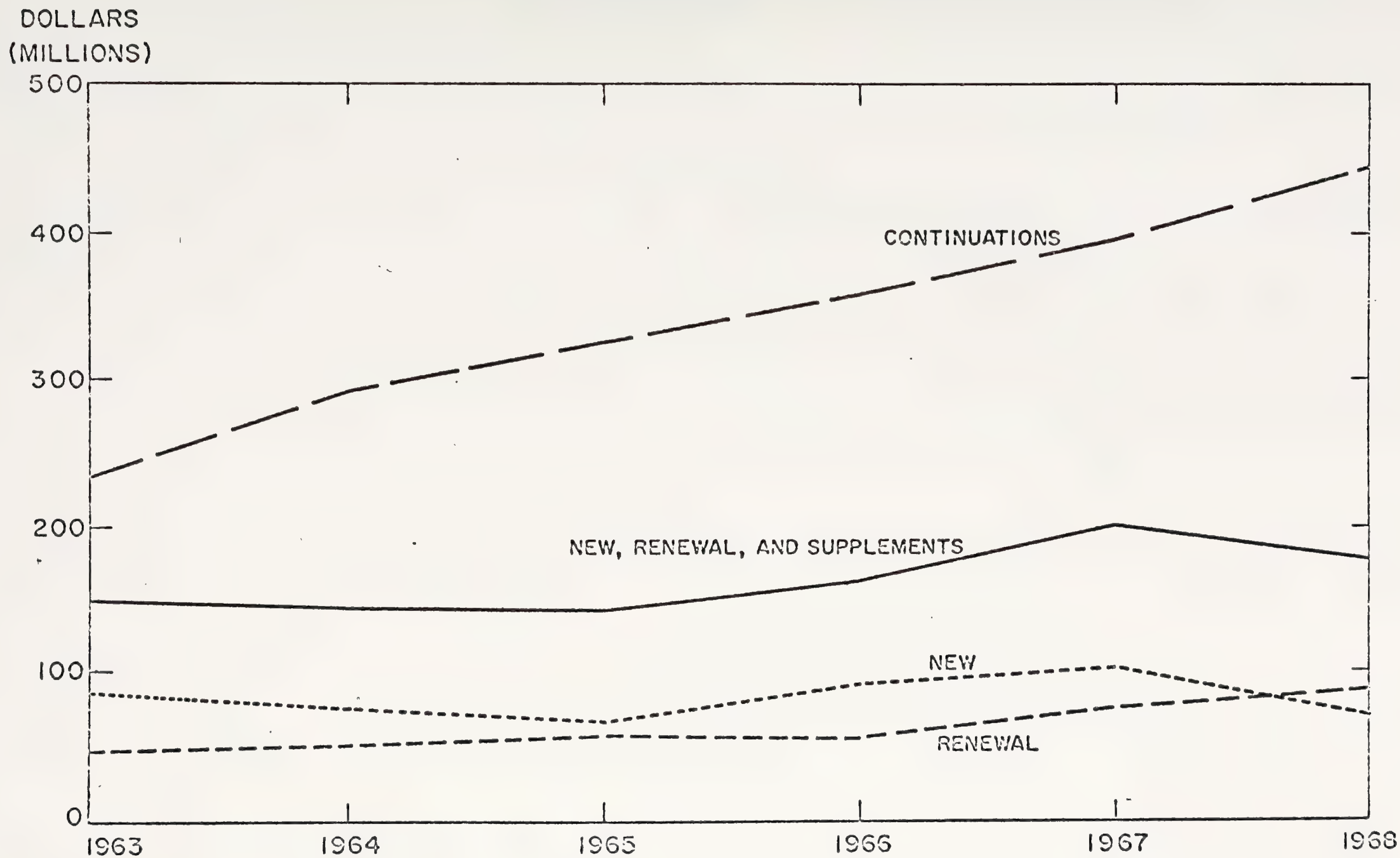
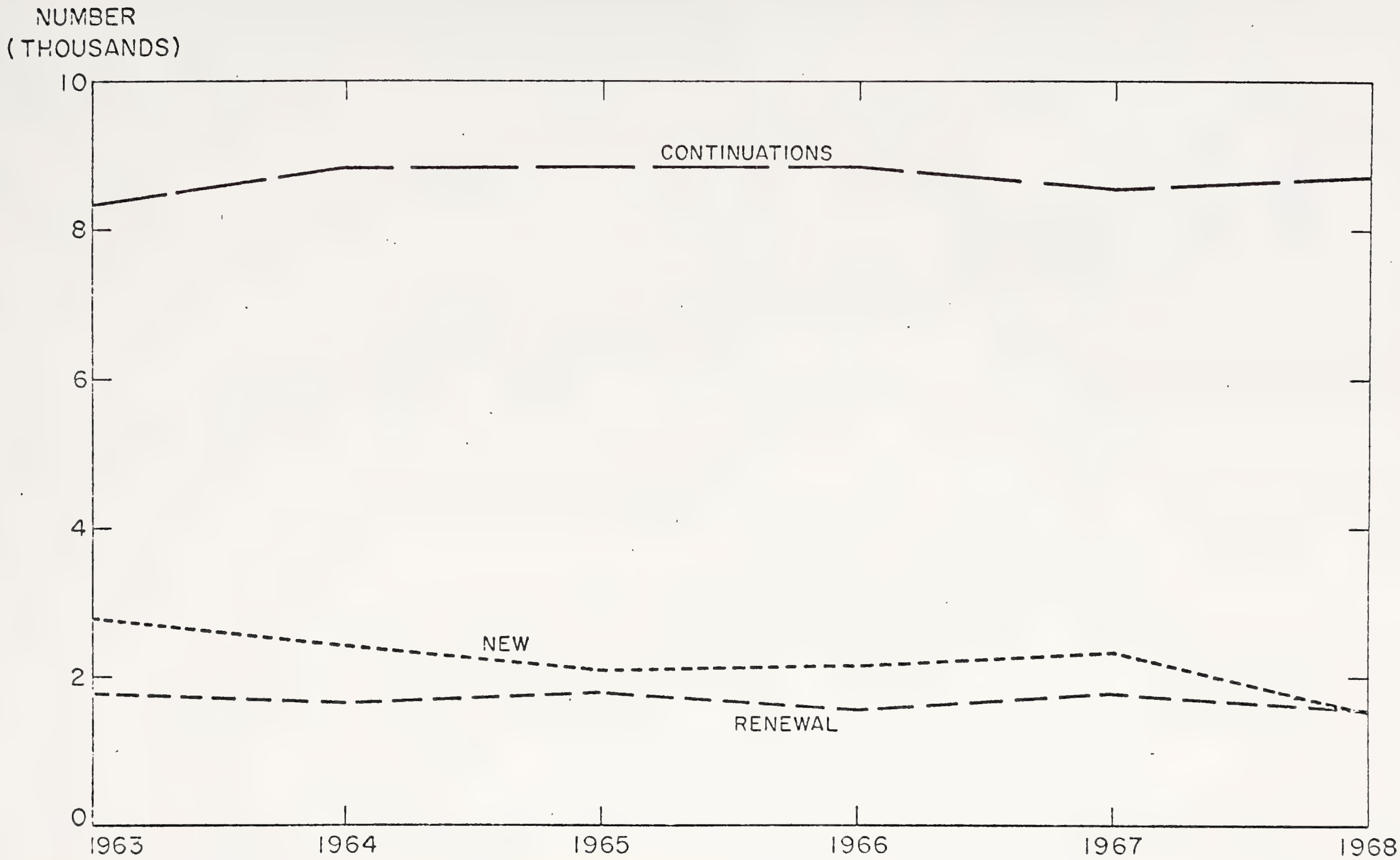


CHART I

NUMBER OF NIH RESEARCH GRANTS
FY 1963-1968

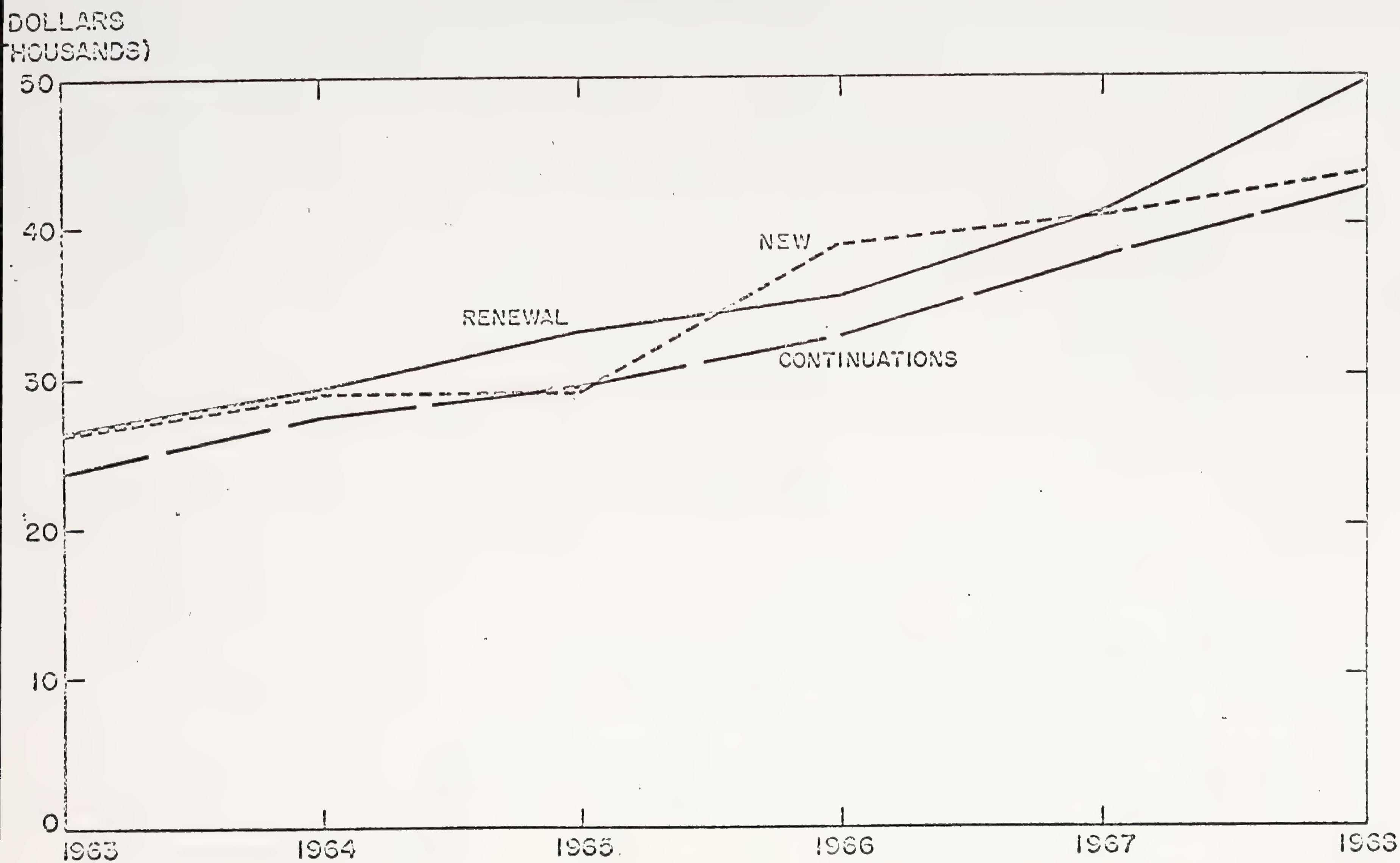


EXCLUDES NIMH, BHM AND NLM.

CHART 6

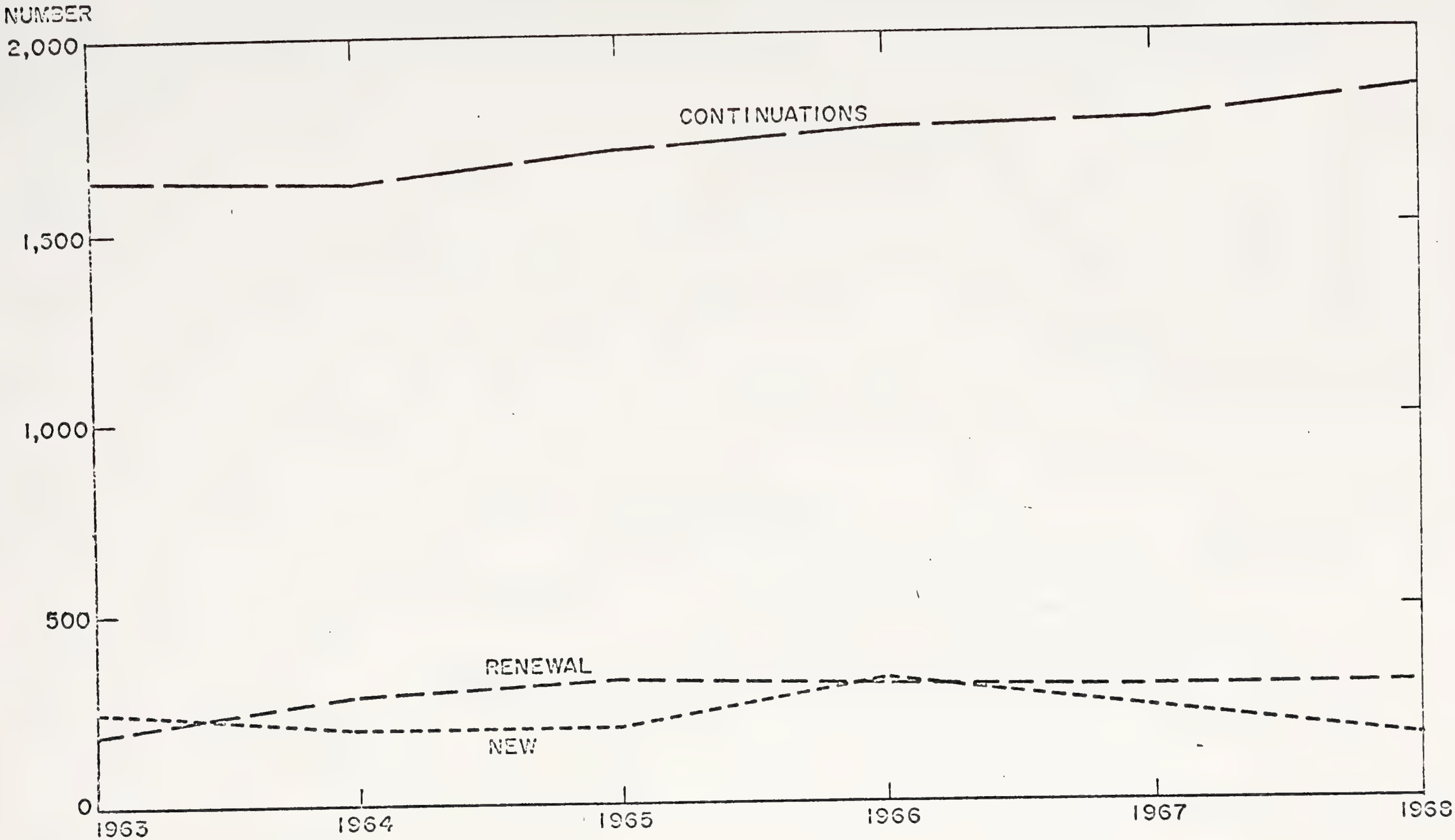
AVERAGE DOLLAR VALUE OF NIH RESEARCH GRANTS

FY 1963-1968



NUMBER OF NIH TRAINING GRANTS

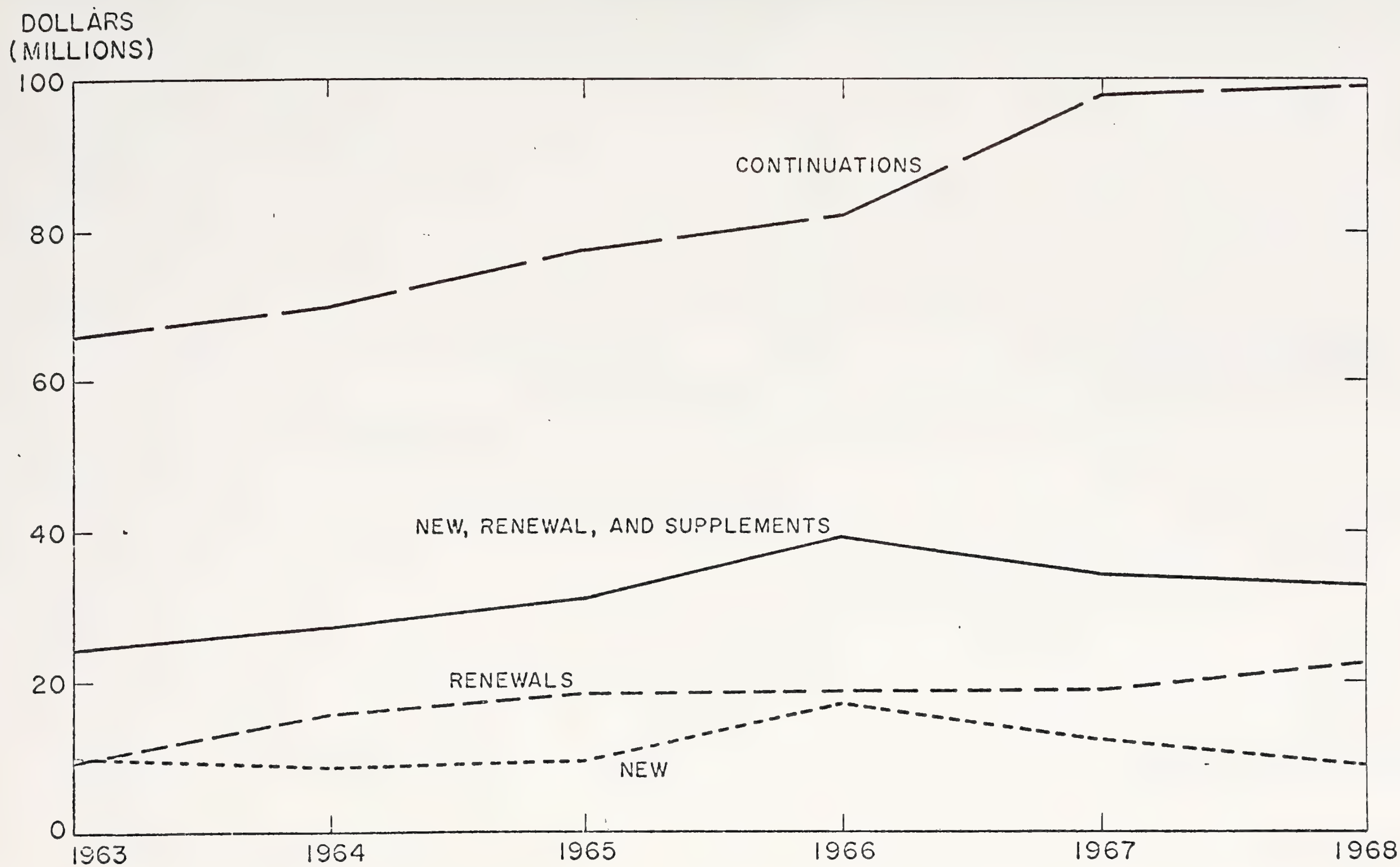
FY 1963-1968



EXCLUDES NIMH, BHM AND NLM.

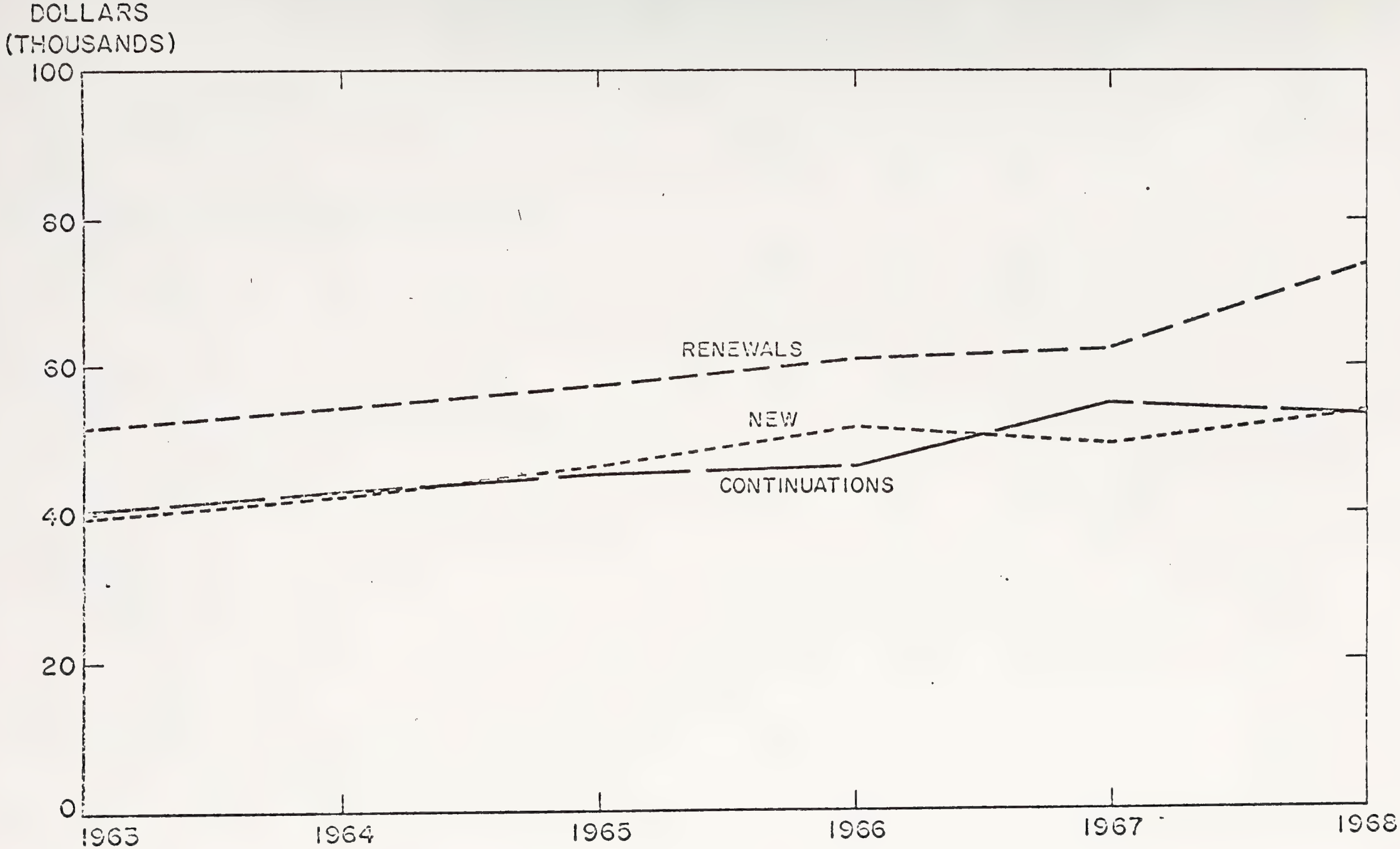
DOLLAR VALUE OF NIH TRAINING GRANTS

FY 1963-1968



EXCLUDES NIMH, BHM AND NLM.

AVERAGE DOLLAR VALUE C. NIH TRAINING GRANTS
FY 1963-1968



EXCLUDES NIMH, BHM AND NIH.

BUREAU OF HEALTH PROFESSIONS EDUCATION AND MANPOWER TRAINING

Appropriations, 1965 - 1969
(in millions of dollars)

	1965	1966	1967	1968	1969
TOTAL	136.8	154.0	277.3	344.5	240.7
Health Professions Educational Assistance					
Educational Improvement	--	10.5	30.0	52.5	66.0
Loans	10.2	15.4	25.3	15.0	15.0
Scholarships	--	.2	4.0	7.2	11.2
Construction	100.0	75.0	135.0	175.0	75.0
Nurses					
Construction	--	15.0	25.0	25.0	8.0
Payment to Diploma Schools of Nursing	4.0	2.5	6.0	3.0	3.0
Project Grants for Improvement of Nurses Training	2.0	3.0	4.0	4.0	4.0
Nursing Traineeships	8.0	9.0	10.0	10.0	10.5
Nurses Educational Opportunity Grants	--	--	.5	5.0	6.5
Nurses Student Loans	3.1	8.9	16.9	16.0	9.6
Allied Health					
Construction	--	--	0.0	3.0	1.8
Educational Improvement	--	--	3.3	9.8	9.8
Traineeships	--	--	.3	1.5	1.6
New Methods Grants	--	--	.2	1.0	1.2
Public Health					
Traineeships	4.5	7.0	8.0	8.0	8.0
Project Grants for Graduate Public Health Training	2.5	4.0	5.0	4.5	4.9
Grants to Schools of Public Health	2.5	3.5	3.8	4.0	4.6

BUREAU OF HEALTH PROFESSIONS EDUCATION AND MANPOWER TRAINING

Appropriation as a Percent of Authorization
1965 - 1969

	1965	1966	1967	1968	1969
TOTAL	100.0	91.0	91.8	86.1	56.3
Health Professions Educational Assistance					
Educational Improvement	--	52.5	75.0	86.7	82.5
Loans	100.0	100.0	98.1	57.7	56.6
Scholarships	--	--	--	--	--
Construction	100.0	100.0	100.0	94.6	44.1
Nurses					
Construction	--	100.0	100.0	100.0	32.0
Payment to Diploma Schools of Nursing	100.0	35.7	60.0	30.0	30.0
Project Grants for Improvement of Nurses Training	100.0	100.0	100.0	100.0	100.0
Nursing Traineeships	100.0	100.0	100.0	90.9	87.3
Nurses Educational Opportunity Grants	--	--	16.7	100.0	92.9
Nurses Student Loans	100.0	100.0	100.0	63.2	31.1
Allied Health					
Construction	--	--	0.0	33.3	13.3
Educational Improvement	--	--	36.5	75.0	57.4
Traineeships	--	--	16.7	60.0	44.3
New Methods Grants	--	--	26.7	44.4	40.8
Public Health					
Traineeships	100.0	100.0	100.0	80.0	80.0
Project Grants for Graduate Public Health Training	100.0	100.0	100.0	64.3	54.6
Grants to Schools of Public Health	100.0	70.0	75.0	80.0	75.9

TAB 9

#596

YOUR FIRST DECADE AS A DOCTOR

By

Robert Q. Marston, M. D.

Washington, D. C.

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February, 1969

(Pages 45-48)

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YOUR FIRST DECADE AS A DOCTOR*

By ROBERT Q. MARSTON, M. D.

Administrator, Health Services and Mental Health Administration
U. S. Department of Health, Education and Welfare
Washington, D. C.

Students of the graduating class, Dean Sleeth, Ladies and Gentlemen. I have chosen as my title today, "Your First Decade As A Doctor." Your first 10 years will be a period of critical importance to you. During this time you should expect much, and similarly, much will be expected of you. Sometimes we are clumsy in expressing what we want. This country is now expressing what it wants more forcibly, but perhaps less clearly, than it has for many, many years. It is expressing it in unusual ways in this election year; it is expressing it in the Poor People's March to Washington starting this weekend; it is expressing it in student protests in universities throughout the land; and it is expressing it in demands that the benefits of the miracles of medicine be extended to everybody. However unreasonable these demands may or may not be, they will not just go away. As a result, the opportunities for misunderstanding were never greater. These days we often start any new project with the expectation—indeed,

*Presented before the Seventh Annual Pre-Commencement Convocation of the West Virginia University School of Medicine in Morgantown on May 11, 1968.

with the conviction—that we will be misunderstood.

Two weeks ago, I met with the Secretary of Health, Education, and Welfare and the advance party for the Poor People's Campaign to hear a series of grievances and demands. What we heard was a reasonable presentation by sincere and concerned individuals—concerned not only for themselves, but, I believe, also concerned for the impact of poverty on all of us.

Despite their sincerity, there was an assumption at one stage that no one in HEW *wanted* to understand, or *could* understand, the delegation's message. To dramatize this assumption a Spanish-American man spoke to us entirely in Spanish, following which we were reminded, "You see, you couldn't understand a word he said." The point was well made, and it was valid for most of us. But what the visitors didn't know, and couldn't know, was that Secretary Cohen speaks and understands Spanish. When he replied, he did so in Spanish, assuring them that while he could not understand the previous speaker in full, he did have a partial understanding.

There is, of course, another aspect of our failure to understand each other. Often, it seems to me, the words "I don't understand," or "I don't know what you mean," actually mean "I disagree with you," or "I won't do what you want me to do." "No speak English" is a time-honored way to refuse to comply. When there is an attitude like this, a positive result is naturally impossible.

I want to talk to you today about clarifying our goals as a way of improving our understanding of each other. You are moving into your first decade as physicians, a decade that promises

to be the most challenging and most exciting the health field has ever seen.

First, however, let me express my deep appreciation for the opportunity to be with you today. My association with the West Virginia University School of Medicine started on a very personal basis more than 20 years ago. About one-third of my fellow students during my junior and senior years in medical school had completed their first two years at West Virginia University. Later, when I moved into medical administration, I worked with Dr. Van Liere and others to ensure that West Virginia students coming to the Medical College of Virginia after the two-year course here would do so under no handicap. During the time that I was Assistant Dean in Charge of Student Affairs and Chairman of the Admissions Committee at the Medical College of Virginia, I always worked closely with students and faculty and the administration of this institution, and I was involved in the phasing out of the program of cooperation and mutual understanding between the two states when it was no longer needed. Over all these years, I have enjoyed working with Dean Clark Sleeth and other members of your faculty.

This association with the West Virginia University School of Medicine has real pertinence to the main theme of my message to you today. I have watched this state mobilize its forces to provide health care for its citizens, beginning prior to the start of the present substantial Federal support program for medical education. This unusually strong emphasis illustrates the special role of health activities in our society; for health activities can be productive, not only in achieving better health for its own sake, but

in providing a model for similar activities in other areas of social concern.

Throughout the ages health has been considered as much more than a means of satisfying individual desires for well-being and freedom from pain. It has been viewed as essential for the development of a meaningful society. Fortunately, for the most part health efforts have not been subjected to the whims of prejudice, politics or sectionalism as have so many other important endeavors. Yet today, both in this country and around the world, we still want more health than we have, and we are capable of attaining better health for our people than we have achieved in fact. This condition has always been true, of course. Hopes and expectations have never coincided with the real situation. But in recent years our awareness of this discrepancy has increased, and the forces, political and otherwise, that can do something to reduce the discrepancy are being recognized and mobilized. We are realizing in all aspects of medicine that an accommodation to these forces is not only necessary but may markedly increase our ability to achieve the goals we all set for ourselves when we first entered medical school.

But we have a problem with timing. I sense that decisions made last year and the year before, not just in government but throughout the Nation, in response to pressures for more and better health, may already have determined the way you will practice medicine in the early 70's. The decisions we make in the next few years will determine to a considerable extent the general nature of health care for the next decade or two.

We are faced with a problem not unlike that of the jet pilot. At any given moment he realizes

that the attitude and direction of his plane was determined at a point several miles behind. In the new, fast-moving situation in medical affairs, decisions have already been made that will determine with an awesome inevitability where we will be at some point in time still well in our future.

It is therefore essential to focus more of our attention on what we are aiming for 10 or 15 years from now, rather than on the detailed problems of this year and next year. In addition to avoiding the immediate constraints in terms of manpower and financial resources—which handicap our ability to make short-term decisions—by looking at what we want 10 or 15 years from now, we may also be able to understand each other better here and now and benefit from the buffer of time.

No one in this room would question his individual duty to provide, to the best of his ability, the best health care for all for whom he has responsibility. This devotion to service has been typical of physicians throughout history. And yet the implications of this devotion for the individual are constantly changing. They were quite different as described by Sir Thomas Browne in *Religio Medici* in the 1600's, and by Sir William Osler at the turn of the present century. And they will be seen in a different light by this year's witnesses before Congressman Staggers of West Virginia, Chairman of the Interstate and Foreign Commerce Committee, as they testify in hearings on two important bills, the Health Services Amendments of 1968 and the Health Manpower Bill.

If I may interpret Sir Thomas Browne's writings, I think he was primarily concerned

with the nature of man—a concern that the physician have a sound understanding of his fellow man from the very deepest philosophical base. He wanted the physician to blend the soul and the body by understanding himself better. Osler, two and a half centuries later, on the other hand, was determined that the physician should focus his full attention on the needs of the patient. This concern was exemplified by his introduction, among other things, of the clinical clerkship at Johns Hopkins. Indeed, the whole concept of his textbook, the "Principles and Practice of Medicine," was to emphasize general principles to be applied to the problems of individual patients, rather than follow the common pattern of the times, which was to apply the skills and pet theories that the individual physician possessed—almost regardless of the needs of the patient. We should remember, too, that Osler's conviction that the physician must see his patients *in the community* underlay his strong dissent from the decision made at Hopkins to go to the system of a fulltime clinical faculty. That dissent contributed to his leaving America to become Regius Professor of Medicine at Oxford.

Moving into the present, Mr. Staggers and others in Congress this year face the need to identify the necessary and appropriate Federal actions to mobilize talent in medical research, to supply health manpower, and to organize and deliver health services, including all of the preventive, curative and restorative aspects of medicine, to those who need them. To do that, they will have to look closely at what the state of the Nation's health should be in the late 70's. They will have to look equally clearly at where we stand today. And along with all of us, they will have to chart a course to get there from here.

How shall we envision our state of health in the late 1970's? In terms of medical and scientific capability, the individual American man, woman or child could be very healthy indeed. He will be heir to the great scientific progress we have already achieved, plus the advances to be made in 10 additional years of accelerating research effort. He will be the heir also of sweeping social pressures which will have transformed good health from the status of a privilege for the fortunate to the status of a right which all can claim.

This hypothetical American of the year 1978 could have readily accessible to him, wherever he lives, a remarkable battery of preventive, curative and restorative services — capable of maintaining him in good health, detecting and diagnosing the onset of disease at an early stage, treating it efficiently, and restoring his strength and capacity for self-fulfillment. He also could be living in an environment that is not only free of unnecessary hazards to his health but also is positively conducive to productive living.

He *could* have these services in that kind of environment. Whether he *will* have them or not depends on decisions now being made. Congress will make some of them. Other governmental agencies and individuals will make others. So will the medical profession, the hospital profession, the universities and medical schools. Finally, very important participants in this decision-making will be the public—the people we seek to serve. Ultimately, health is their concern. We must, of necessity, talk about laws and authorities, politics and systems, plans and budgets; but at its root, health is a particularly personal province of individual human beings.

If we can agree on the nature of our health goal for 10 years hence, how shall the implementing decisions be made? Quite clearly we have a long distance to travel to change today's hopes into tomorrow's realities. We know that millions of our people are not being served as they might be served. We know that the costs of care are rising very rapidly. We know that we face shortages of basic resources—manpower and facilities—and that the demand for care will make these shortages even shorter. Meanwhile the pressures for action—for change—are building up throughout society. In seeking to accommodate to these pressures in a responsible and reasonable fashion, we must recognize that there are no evil dragons to be slain, no villians seeking to limit achievements in the health area. The problem is that we shall be trying to do something that has not yet been achieved, and for which no one has a blueprint. Basically, we will be trying to strengthen even further our present base of tremendous biomedical research accomplishments and then to make the fruits of our efforts and those of this country's unique medical education system available to all. And we must do this under conditions that will work best in our democratic society.

The social pressures for change, based upon the age-old desire to have the best health for all, plus acceptance of the relatively recent belief that health is a human right, have established beyond doubt a governmental responsibility to participate in the process of fulfilling that right. The question is no longer whether there is a Federal role in health, but how to define that role and how to use the Federal resources most effectively in partnership with other resources in the private segment of our society.

There are the problems that Congress is struggling with this year, and we can be sure that county governments and state governments will be increasingly concerned with them in the future. They are the problems that the President and all of us in the health components of the Federal establishment are grappling with. And they are the problems you and your fellow physicians will be helping to resolve in the next decade.

Some of the processes of definition have already been accomplished and some of the tools and mechanisms for interplay of Federal and non-Federal resources are already at hand. Passage of the Social Security Amendments of 1965, which include the Medicare and Medicaid programs, provided mechanisms for Federal participation in the payment of medical costs. Two years before, the passage of the Health Professions Educational Assistance Act provided mechanisms for supporting increases in quality and quantity of health manpower. Mechanisms for supporting biomedical science and the development of medical facilities were already at work.

In all of these cases, the necessary and appropriate role has been defined in terms of support, of assistance, of stimulation of non-governmental effort. Medicare and Medicaid help to buy care that is already there. The other programs I mentioned give impetus and encouragement to local incentive—in conducting a research project, in building a hospital, in expanding a medical school.

This same principle is now being followed in the area where the pay-off should come—in developing systems and relationships to deliver care to the people who need it. The Regional

Medical Programs, created by the Heart Disease, Cancer and Stroke Amendments of 1965, and the Partnership for Health Program, authorized by the Comprehensive Health Planning and Public Health Amendments of 1966, are both designed to start processes which will help make better care more readily accessible. Neither of these impose a Federal system. Both depend on and encourage initiative where it counts—out where the services are being delivered. On the non-government side, the American Medical Association, American Hospital Association, Association of American Medical Colleges, the voluntary health agencies, insurance companies, labor unions, and a number of citizen organizations are increasingly active.

We don't know whether any of these efforts will work. Let me repeat that this Nation is trying to do something that has never been done before—to create an environment in which a highly pluralistic system will develop cooperative patterns of many components working together so that each component will be able to do a better job of delivering health care.

I am convinced, and I speak as a citizen and not as a Federal administrator, that the Nation's powerful array of medical talent will rise to the challenge of change and will carry out its part of the overall responsibility, although in the process, I think, it will be seriously tested. The world of medicine you are entering as graduates is a world in process of accommodating to enormous changes. It presents an exciting scene. It offers more options for your talent and skill than any previous medical landscape in history.

For the last month, I have been looking with growing humility at one section of this landscape—that encompassed by the new Health

Services and Mental Health Administration—with its array of activities and programs. Its responsibilities include those of direct health service to the Indians, the operation of Public Health Service hospitals, quarantine stations, and other direct activities in this Nation and internationally. It is concened with prevention of disease and the major problems of mental health, including research, training and the delivery of services. It has a major responsibility for maintenance of a national health statistics system. And it has a heavy investment in the so-called innovative programs—Partnership for Health and Regional Medical Programs. Most recently, it has established the National Center for Health Services Research and Development, so that we can have an appropriate balance between the development of new knowledge through research and its utilization.

This is a powerful array of authorities and mechanisms designed to assist a far more powerful array of forces, including the medical and other health professions, and ultimately to serve the whole 200 million people in our Nation.

I began by talking about opportunities for misunderstanding in this uncertain decade. This suggested that a clarification of goals was one way of approaching understanding; and this led to a description of some decisions being made by the Federal government that will affect health in the years ahead. By means of this somewhat wandering recitation, I hope you caught a sense of the sweep and scope we can expect in medicine in the years ahead; and I hope you caught a sense of the shared commitment to the goals of medicine—which are as old as civilization—projected against a society that is as contemporary as today's televised news via satellite.

I have been in government for a little over two years. Five or ten years from now, I may not be in government. I don't believe I think any differently in my present position than I did when I was treating patients, doing research, or teaching, or even than when I was a medical student. In all of these activities, and in my present one, the primary goal has been to improve the health of people.

Today attainment of that goal requires more than ever before that people in and out of the health field develop an increased understanding of shared commitment. If we can work together, we can accomplish all that is needed.

TAB 10

The Charter Day Address

Medicine — An Endless Frontier

Robert Q. Marston, M. D.

Director, National Institutes of Health
Department of Health, Education and Welfare

It is a deep pleasure and a high honor to take part in these Charter Day exercises. The pleasure derives to a large extent from long and happy associations with Williamsburg, and the honor, from the magnificent tradition and achievement of this institution.

It is also my pleasure to be the bearer of a warm tribute on the opening of the John Millington Hall of Life Sciences. While NIH has not played a part in financing the construction, our sister agency in the Department, the Office of Education, was a major contributor. I bring you greetings from our new Secretary, Mr. Robert Finch, who sends his best wishes on the dedication of this building and his congratulations on the 276th anniversary of the chartering of the College by King William and Queen Mary.

My purpose today is twofold. First, to venerate and to learn from an illustrious past through these Charter Day exercises, which commemorate the high place our forefathers gave to education through the establishment of the College of William and Mary in 1693.

My purpose is also to dedicate to the future both human and physical resources, through the ceremony commemorating the completion of the life sciences building.

These are major charges to any speaker, especially one whose very beginnings and life have been so personally conditioned by Williamsburg, Toano and James City County on the one hand, and by science and medicine on the other. The present occasion is an adequate stimulus to seek and to share bold new truths and understandings concerning the relation of medicine and science to the needs and hopes of our society.

Thus, in looking forward to this day, I have enjoyed the opportunity to range freely over many writings and recollections, rereading

a bit of Wyndham Blanton's valuable three volumes on medicine in early Virginia, savoring some of William Osler's thoughts on the relationship of doctors and nurses to other people, reviewing a series of studies on science, government and society. And I have reflected upon some of my own thoughts, both childhood impressions as I watched early history in review during the restoration here and those expressed in my recent writings about the necessity to seek new ways to reconcile Federal stewardship in the use of funds with the need for regional talent and the determination to meet local and regional needs. In a broader vein, I have been looking back on personal experiences and writings concerning the changing role of this nation as it has assumed leadership in health and science.

It has been pleasant, I repeat, to think about today against such a background. But I have also been reading Jacques Barzun's concerns about the ability of the American university to survive the pressures of our current social unrest exemplified by student riots and racial conflict. I could not escape the pessimistic but compelling population predictions, the warnings of environmental threats, the impressions of deteriorating confidence in government, in our institutions, and in one another. And I awoke from my daydreams to the realization that the most significant aspect of a Charter Day exercise at William and Mary, involving the dedication of a science building, is after all *the timing.* The fact is that such events on a college campus in February 1969 have quite a different import than they would have had last year or ten years ago. I realized that a speaker on such an occasion would do well to select limited goals, focus on the world as it is today and the present issues, rather than to fabricate platitudes about the future. Permit me, however, this one indulgence—a quotation from Robert Ardrey's poetic *African Genesis*:

> ... we were born of risen apes, not fallen angels, and the apes were armed killers besides. And so what shall we wonder at? Our murders and massacres and missiles, and our irreconcilable regiments? Or our treaties whatever they may be worth; our symphonies, however seldom they may be played; our peaceful acres, however frequently they may be converted into battlefields; our dreams, however rarely they may be accomplished. The miracle of man is not how far he has sunk but how magnificently he has risen. We are known among the stars by our poems, not our corpses.

There were several thoughts behind my choice of the title "Medicine— An Endless Frontier." First, I wanted to explore briefly the role

of medicine in the greater society. Second, in paraphrasing the title of Vannevar Bush's report made soon after World War II—a basic document for public discussion of the role of science—I invite comparisons of the situation we then faced with the present one. And third, I submit that the opportunities in medicine extend beyond the boundaries of geography or time, and that in medicine and science America today bears a unique torch for the world and for the destiny of mankind.

Time and again medicine has been instrumental in advancing the frontiers of other fields. Freedom from epidemics, extended life expectancy, and the hope of recovery from illness have changed our ways of thinking about the world and about ourselves. If indeed the age-old true enemies of man are illness, poverty, ignorance, and war—or the propensity to make war—then it is clear that medicine has much to offer in the broadest social context.

Medicine has a more specific relationship to educational institutions. George Packer Berry, a former dean at Harvard, has expressed it this way:

> The roots of Anatomy run deep—to Galen, to Aristotle, to their origins in the valleys of the Euphrates and the Nile. Long before medieval scholasticism had yielded to Renaissance thinking, anatomists were emerging as predominant teachers in the faculties of medicine. There is no older faculty in the university than that of medicine, its beginning dating back 900 years to the first, the School of Salerno. Montpellier, Paris, Bologna, Padua followed. Thus medicine—the mother faculty of all scientific faculties—with the anatomist as its central figure, is the nurturer of science.

It is not surprising to find that half of the current budgets of several major universities are devoted to the health field, or that medical research is often viewed as a model in planning other research, or that the educational developments in schools of medicine and dentistry are studied by other professions. At the same time, the rising anticipations and expectations in the health field serve as a focal point in considerations of social issues, whether they be the needs of the poor or the menace of environmental contaminents or the need for better understanding of the problems of population. Medicine is an endless frontier because it crosses so many fields of vital interest to man.

But America as a nation did not always give substantial support to its medical and research institutions. Indeed, it was as recently as 1910

that Abraham Flexner made his devastating report on the sorry state of medical education, which resulted in the closing of about half of the medical schools of that day. Traditionally, physicians as well as chemists, physicists, and others looked to Europe for both their education and leadership; and until World War II, even our best universities, for all our resources, still compared poorly with the ancient European centers of research and teaching.

During the war, two things happened. First, those ancient and illustrious institutions of Europe were largely destroyed or disrupted. And second, our country had found that research could so affect military events as to determine the war's outcome. But we had been ill-prepared to utilize scientific talent, which was largely dispersed among universities and had been supported in a haphazard and indifferent fashion.

Vannevar Bush, the Director of the wartime Office of Scientific Research and Development, was asked by President Roosevelt for recommendations on the shape of postwar science. These were forwarded in a report to the President entitled "Science—The Endless Frontier." This recommended the termination of OSRD (some of whose grants NIH inherited) and it provided a basis for public debate and congressional action which had not been possible during the war. It also focussed attention on one of several questions addressed to the scientific community; What can be done to organize a program for continuing the wartime effort in medicine and related sciences?

Application of the government-university relationship to medical science as a national policy grew from the mounting cost of medical care and education, combined on the more positive side with the postwar recognition that no endeavor offered more promise in the peacetime world envisioned by Dr. Bush than did medical research. My old chief Howard Florey's work with penicillin on the battlefields of North Africa shared attention with the Manhattan Project's success in the production of the A-bomb. The agency with this responsibility for medical-science support was to be the National Institutes of Health. Over the years its budget rose from less than $3 million in 1945 to more than a $1 billion for grants and direct operations.

But the important story is not in terms of dollars or size. It is the story of accomplishments in biomedical science and their contributions

to our health and welfare of which everyone in this audience is aware, and of the development of new and effective ways to share the responsibilities and decision-making between Federal and non-Federal institutions. Because NIH has been successful in these respects, let me speak briefly about our research component.

The purpose is to improve the health of the American people through the support of research and research training. Ten National Institutes, such as the Cancer Institute, which is our oldest, and the National Institute of Environmental Health Sciences, our youngest, make grants to educational, scientific, and other nonprofit organizations. This activity is administered on the basis of expert advice, provided first by study sections composed of the best consultants available throughout the Nation to consider applications, and then by National Advisory Councils of non-Federal experts and civic leaders. Scientific merit and the promise of an advance in our understanding of health and disease are the prime criteria for selection. In addition, these panels offer advice for the development of the total program of the Institute.

Most of the Institutes also conduct direct research programs at our 300-acre Bethesda headquarters. Not only do these dedicated scientists make contributions of their own—often in areas that have not proved attractive to university-based scientists—but they provide a readily available, unbiased source of scientific advice which has long been invaluable in the formulation of NIH policies. The high caliber of these individuals is indicated by two awards given within recent weeks to NIH scientists—the Nobel Prize to Marshall Nirenberg for deciphering the genetic code, and the President's Science Medal to Bernard Brodie for his brilliant contributions to pharmacology.

One is tempted to go on citing the successes of NIH programs, but my thesis for today—that medicine is an endless frontier—does not permit one to dwell on past accomplishments. If we are able to help advance that frontier, it is because NIH and the field of medicine in general are testing grounds for new ideas—ideas that can be explored systematically—and because of the great importance of health to people.

Thus, in February 1965, President Johnson wrote:

> A healthy citizenry has traditionally been one of this country's foremost goals. To meet increasing demands for new knowledge which are created

by this objective, the National Institutes of Health have grown precipitously in the post-war years. * * *
To provide assurance that such a large Federal enterprise is being conducted with maximum effectiveness, and in furtherance of President Kennedy's suggestion that a qualitative evaluation of the NIH operations be made, I requested such a study in early 1964. * * *
Its significance goes well beyond the NIH. * * * The unique cooperation of government, universities and private enterprise, which characterizes so much research and development in this country, has been explored in the context of NIH operations.

The report of the Wooldridge Committee's study to which the President referred makes the following statement:

> We suspect that there are few if any one-billion-dollar segments of the Federal budget that are buying more valuable services for the American people than that administered by the National Institutes of Health.

Now to the research mandate of NIH were added last year the large and growing responsibility for the support of professional education and manpower training. There is a shortage of health workers of all types at a time when the demand for health services is mounting. This condition is leading to frustration on the part of the consumer, together with some sense of alienation among physician and nurses which, with other unfortunate results, could compound the problem of drawing talented young people into the field.

One is reminded of an earlier situation, real or concocted by the fertile imagination of William Osler:

> There are individuals—doctors and nurses, for example [he said at Johns Hopkins in 1891]—whose very existence is a constant reminder of our frailties; and considering the notoriously irritating character of such people, I often wonder that the world deals so gently with them. The presence of the parson suggests dim possibilities, not the grim realities conjured up by the names of the persons just mentioned; the lawyers never worries us—in this way, and we can imagine in the future a social condition in which neither divinity nor law shall have a place—when all shall be friends and each one a priest, when the meek shall possess the earth; but we cannot picture a time when Birth and Life and Death shall be separated from the "grizzly troop" which we dread so much and which is ever associated in our minds with "physician and nurse."

But in the same address, that great and wise physician also stated:

> In the gradual division of labour, by which civilization has emerged from barbarism, the doctor and the nurse have been evolved, as useful accessories in the incessant warfare in which man is engaged.

In addition to the business of creating opportunities for young

people to wage that "incessant warfare," NIH has also acquired the responsibility for administration of the National Library of Medicine, the Government's main biomedical communications center. The problems of education are not limited to the undergraduate or graduate student, but must extend beyond the university and teaching hospital to the world of medical research and practice. Thus the National Library of Medicine increasingly emphasizes the role of the library as reaching far beyond that of a mere repository of books. Rather, it is concerned with making information available to those who need it in ways that best serve the various health fields.

The final support for my view of medicine as an endless frontier deals with those aspects of medicine which make it independent of time or place, politics or nationalism—aspects, indeed, that make it an important part of the whole history of man. No one can set a boundary to the march of medical research, medical education, or medical service. Throughout history, the torch of progress has passed to many parts of the world. Today it plainly rests with this nation. Elsewhere things may be done or not done, deferred or accelerated, on the basis of decisions made in this country. Where do we stand in the light of this awesome responsibility?

Our national record of performance is impressive. Certainly, American medical research does benefit all the world. Yet we have been decreasing our research carried on in other parts of the world—even research conducted abroad for our benefit. We continue to draw top scientists to this country, and even import physicians and nurses—not only from the developed countries but from struggling areas whose health problems vastly exceed our own. Finally, while we lead the world in the productivity of our biomedical research and the splendor of our educational institutions, we are not the envy of the world in terms of our ability to meet the growing demands for health services at a cost within the means of every citizen.

It is against this background of contradictions and unsolved problems—a background, too, of turmoil that sharpens men's minds and stimulates nations and societies to seek solutions—that one appreciates the role of the young people of the nation who must carry on the work and seize the opportunities. It is for the adults among us—for the "Establishment," if you will—to be sure that those who would devote their lives to health careers *have* such an opportunity.

Recently the American Association of Medical College and the American Medical Association issued a joint statement calling for the creation of places in medical education for all qualified applicants. This will not be easy to do, but it is a worthy goal—not only because of the national need, but because it is untenable that, as this nation moves from an industrial to a service economy, the talented and dedicated young person should have unlimited opportunities in law or religion, in business or entertainment, but that he is barred from medicine by an arbitrary and finite limitation.

As we move forward into the decade of the seventies, it is essential that we maintain medicine as an endless frontier. We must continue to honor the local, state and national commitment that has made it possible to dedicate here today the John Millington Science Hall. Yes, we must continue to supply the physical resources for the future. Further, we must give the support that will make it possible for talented young people to choose a career in the health fields—to be a research scientist, practicing physician, dentist, nurse or allied health worker. Finally, we must seek new ways to insure the achievement of national objectives in health care through a meaningful involvement of talent and motivation at the local level.

The experience of the National Institutes of Health offers some clear guidance in the definition of national goals and policies. After adequate debate in Congress, those goals and policies are seen as best implemented in nongovernmental agencies. Most of the NIH research budget and essentially all of the manpower bureau's funds are awarded to non-Federal institutions. I believe this has proved a wise and productive arrangement, and as I view the task before us, it is to strengthen these relationships in ways that will ensure the continued viability, progress and effectiveness of American medicine.

Ladies and gentlemen, in closing I should like to add a further word about the science building we have dedicated on this, the 276th anniversary of the great College of William and Mary. It is named the John Millington Hall of Life Sciences, after a distinguished man who played a major role in this college and in the lives of his associates. The students and teachers who work here are a key part of that Endless Frontier of which I speak, because here it all starts; the choice of a career, the awakening to the wonders and mysteries of biology and

psychology, the establishment of the factual and conceptual base on which many will build in subsequent study. This life science building will be a doorway into all the health fields for those who seek to serve their fellow man in these professions.

And the functions carried on within its walls will affect to some degree all other activities of the College. They will ultimately affect the historian, the engineer, the law student, those who major in language, theology, or any other subject—because this is 1969. This is a time in our country, and perhaps in the world, when thoughts are turned more crisply toward the needs of *people* than at any other time in our history since the early struggles of our forefathers as they sought to create a government to serve us all.

Finally, because this building is in America in the last third of the twentieth century, it symbolizes the greatest opportunities in the life sciences that the world has ever known. And because I am personally familiar with the great strength that the College of William and Mary traditionally maintains in the area of the life sciences, it is my conviction that those who leave the John Millington Hall will readily grasp the opportunities and responsibilities available in these fields today.

So we are back at where I began: that the dedication of this building, at the College of William and Mary on its Charter Day, symbolizes for me the endless frontier offered in the life sciences and, more broadly, in medicine. It symbolizes opportunities for highly meaningful service in the prevention and cure of disease and the alleviation of suffering—indeed, opportunities to improve our understanding of man himself—and to do so at a time when these matters have unique relevance to the problems of our society and of all mankind.

When Thomas Huxley a hundred years ago saw America for the first time, he said, "I am not impressed by your bigness. Size isn't grandeur, and territory doesn't make a nation. The great question is, 'What are you going to do with it all?' " And I repeat, the frontier is endless. Let us approach it with the high sense of values, dedication and excitement that were at the heart of our Nation's beginnings here in Williamsburg.

Historical Note

Since 1756, when it granted its first honorary degree to Benjamin Franklin, the College of William and Mary has conferred such recognition upon more than three hundred persons. These have included eight Presidents of the United States, a number of public leaders from Canada, England, France, and Norway, and distinguished Americans in professional and cultural fields from Virginia and other states.

The College at its 1969 Charter Day added to this list the names of two gentlemen who distinguished themselves in their respective fields, and in their service to society. Dr. Davis Y. Paschall, President of the College, presented the candidates to the Rector of the Board of Visitors, Walter G. Mason of Lynchburg.

TAB 11

ROBERT Q. MARSTON*

National Institutes of Health, Bethesda, Md.

FEDERAL SUPPORT OF EDUCATION AND RESEARCH: POLICY ISSUES AND NATIONAL NEEDS**

Members of AOA, friends in the audience, ladies and gentlemen: I am happy to meet with you on this occasion and to share some of my thoughts concerning medicine and its role in American life.

In recent weeks those of us who administer Federal health programs have spent considerable time examining our responsibilities in preparation for discussions with the new Secretary, Mr. Robert Finch, who has been reviewing the broad policy issues of the Department of Health, Education, and Welfare. In the light of these considerations, I might have chosen as my topic one of several major problems confronting us: the severe shortage of manpower in all the health fields; the need to restore man's environment; the need to strengthen the conduits of knowledge and to improve the storage and retrieval of information; the population problem; the cost of health care; or the organization and delivery of health services. But all these have been much discussed of late, and I have chosen to restrict my remarks to the Federal sphere and particularly to issues and needs directly related to the field of health.

An AOA lecture is a student-oriented exercise, with emphasis on the achievement of excellence by students. And it seems quite clear to me that in 1969 student excellence is closely bound to the whole concept of how the world should be and what must be done with it. So I will begin with what I think is the key issue in Washington, in communities, and on college campuses throughout the country. This is the question of *relevance*.

If I read the question correctly, it is whether long-range basic research on biomedical problems is truly relevant to present urgent needs of medical practice, and even whether medical education is relevant to the pressing social needs of our times. One hears the question in many forms. It is raised, for instance, in respect to the role of the teaching hospital, in which research, education, and community service often appear as competitive rather than complementary functions. It is raised whenever one speaks of the allocation of resources—human, physical, or fiscal. It is a question that arises in discussions of curricula, of types of research to be undertaken,

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and of various approaches to the organization and delivery of health services.

The current issue of AOA's *Pharos* presents a symposium on medicine and humanism which speaks to many of these points. It begins with an observation by Albert Einstein: "The concern for man and his destiny must always be the chief interest of all technical effort; never forget it among your diagrams and equations." And a student at Stanford started his paper prepared for the recent American Medical Association Congress on Medical Education with the following quotation:

> Man has continuously worked to increase his sense of personal worthiness by extending his mastery of his physical environment. In this light the conquest of space and the synthesis of DNA take on a deep and greater significance. The answer, of course, lies not in space or in the test tube but within ourselves and in the institutions we create.

Thus, the profound and quite valid question of relevance is raised keenly by students; and you, the students, have been more penetrating at times than faculty members, who in fact initiated some of these discussions many years ago. I will pick only one example, the book *Social Class and Mental Illness**—not only because one of its authors, Dr. Redlich, is here today, but because this plea for relevance of activities in the ivory tower to the needs of society had an influence on me more than a decade ago. It contributed to my working later to effect changes in the organization and delivery of health services and in the educational environment within our institutions to make them more relevant.

One of the questions we shall be asking in the mid-1970's is, What were the agents of change? I believe we shall find in restrospect that the motivation to change included the whole social awakening—the civil rights movement, the student protests, concern about the war, increased faith in our ability to change, and perhaps as much as anything else, the crowding of people throughout the world as a result of the population explosion.

Attention to national needs has been sharpened by a growing, but far from complete, sense of social conscience, if you will. But this does not identify the tools to be used in meeting the needs. A few years from now, it may not be necessary to speak to the importance of research, of education, of defining ones tools; but we have had such a shift of climate in the last year or two that when I appear before an audience today, I assume that it contains elements of an antiscience, antiacademic, antiintellectual outlook. The pendulum has swung very rapidly, and suspicion of the academic world seems to influence the thinking of substantial numbers of people.

My thesis is that research and education, by their very nature, are designed to be agents of change. History, tradition and purpose over the cen-

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* A. B. Hollingshead and F. C. Redlich. New York, Wiley, 1958, 1964 (442 pp.)

turies have shaped these two instruments to serve rather specifically as change agents of profound importance.

It is also true that they can be used as stabilizers of the status quo. Indeed, John Gardner says that even excellent institutions, run by excellent human beings, are inherently sluggish, indifferent to innovation, slow to respond to human need, and not eager to reshape themselves to meet the challenge of the times. And he adds that often those who appear eager for change oppose it stubbornly when their own institutions are involved. "I give you," he says, "the university professor—a great friend of change, provided it doesn't affect the pattern of academic life. His motto is, 'innovate away from home'." And the same could be said about most of us. Yet change is in process, and research and education should be key tools, and we must not throw away these tools at a time when they are most needed.

All trends point toward a constantly growing demand for health services in this country. That demand will continue to increase at such an explosive rate and with such insistence that the demand itself, not estimates of need, will determine the actions taken. I believe that the American people, privately and publicly, will insist on dedicating an increasing portion of the gross national product to health. The $50 billion health industry of today, according to many economists, will move with some speed toward the $100 billion mark in the mid-seventies. So let us start with the premise that there will be an even greater national demand—one accompanied, I believe, by a greater willingness to pay than we recognize at present.

The question facing this Nation in the health field is not whether we are going to make greater commitments to the health of the people, but how to do this effectively on several fronts at the same time. We must be concerned with the organization and delivery of health services—with better deployment of resources, personnel, and facilities. I am deeply concerned with this problem as a Federal administrator—concerned enough to have spent the years that I did in directing the Division of Regional Medical Programs and the Health Services and Mental Health Administration before moving to NIH.

I have spoken frequently, and I think with some force, on the need to stimulate with Federal dollars the totality of health resources—medical schools, hospitals, physicians, nurses, dentists, allied health workers, and lay organizations and individuals—and to do a better cooperative job with the resources we have. But I have always said that the main future determinant of our ability to maintain health, prevent illness, and cure the sick will be the new knowledge and skills we develop, and that the second determinant will be the effectiveness of our educational process. For several

years I have warned against the dangers of borrowing from Peter to pay Paul—of attempting to do more with less. For I believe that grave problems lie ahead if we cannot mobilize the resources needed to maintain the research and research training base and the education of health personnel. Let me remind you of these words from John Gardner: "We are in deep trouble as a people, and history is not going to deal kindly with a rich nation that will not tax itself to cure its miseries."

My first consideration, then, is the need to view biomedical research and education as key agents to be used judiciously in shaping national policy. I should like to talk first about research and then about the support of education along these lines.

A related issue has to do with the distribution of responsibility between Federal and non-Federal activities. The Federal role in both research and education must be a derivative of national policy, of the needs out in the real world. But the existence of a societal problem, however urgent, does not alone determine what the Federal role should be. Without regard to one's political philosophy, the proposed role may simply not be within the Federal domain. It may not be amenable to the tools and powers that the Federal Government possesses. Or finally, if attempted, it might meet with public revolt.

I recall such a revolt, perhaps mild by comparison with today's protest methods, but still curious and telling under the circumstances. In Britain during the terrible bombing of London in World War II, the government, in order to facilitate movement in and out of air raid shelters, ordered all persons to go down on the right side and come up on the left side. Immediately the people did just the opposite, achieving the goal of efficiency but striking a strong blow, even under those urgent and trying conditions, against government edict.

Federal policy in the support of biomedical research in our country was largely established following World War II. Vannevar Bush's report "Science, the Endless Frontier" played an important role in the formulation of that policy. Among other recommendations, the report urged that the Nation strengthen Federal support of biomedical research. It emphasized that the destruction or disruption of the great centers of learning throughout Europe gave this country a unique responsibility, and it also demonstrated clearly how wartime expenditures on science and technology helped achieve a major social objective: military victory.

Science today continues to help the Nation attain its health goals. This is reflected, for example, in the recent International Conference on Rubella Vaccines, at which scientists reported encouraging progress in efforts to

control a disease that has long presented a serious threat to fetal life. As one participant expressed it—

> Rubella symbolizes those events which can interrupt a life before it reaches the world, or set the stage for an existence marred by heart, sight, and hearing disorders, blood and bone abnormalities, and mental retardation. Until very recently, these occurrences have been viewed as something akin to the acts of God, beyond human intervention. The child lived or he died, and if he lived, his defect was a burden to be borne. Never until now, across the long centuries, have we dared to presume that these events could be understood and prevented.

Federal policy on support of biomedical research is closely related to national issues and needs because the Government, for a variety of reasons, supports such a large proportion of biomedical research and research training. It plays the major role in determining the level of action, the rate of growth and the general direction of the effort.

This is not to say, of course, that all these decisions concerning biomedical research are made at NIH. The principle of the balance of powers in the determination of Federal research policy has its parallel elsewhere in Government. There are effective checks and balances among the agencies, scientists, institutions in the field, and of course the Congress. But as budgets have become constrained, experience has emphasized that a decision finally reached in Washington has an immediate impact on the nature and level of research in institutions throughout the country. The decisions are not limited to the specifics of individual science projects, but now play a major role in determining the viability and direction of whole departments and even major institutions.

As one turns from research to the question of Federal support of education and training in the health field, some key differences are immediately apparent, although our experiences here are more limited. It was not until the Health Professions Educational Assistance Act was passed in 1963 that the Federal Government became involved in the direct support of medical education. Moreover, the Federal role has been relatively minor, with the exception of construction assistance.

Further definition of the Federal role in the support of education in the health professions is needed. For example, there is the question of whether we are going to have student support through a cost-of-education grant to institutions, among which the student can choose. This approach would have major impact in assisting the disadvantaged individual. On the other hand, many educational institutions are having such critical problems in terms of survival that the question of block grants is undergoing close scrutiny in such proposals as the Miller bill, now before Congress.

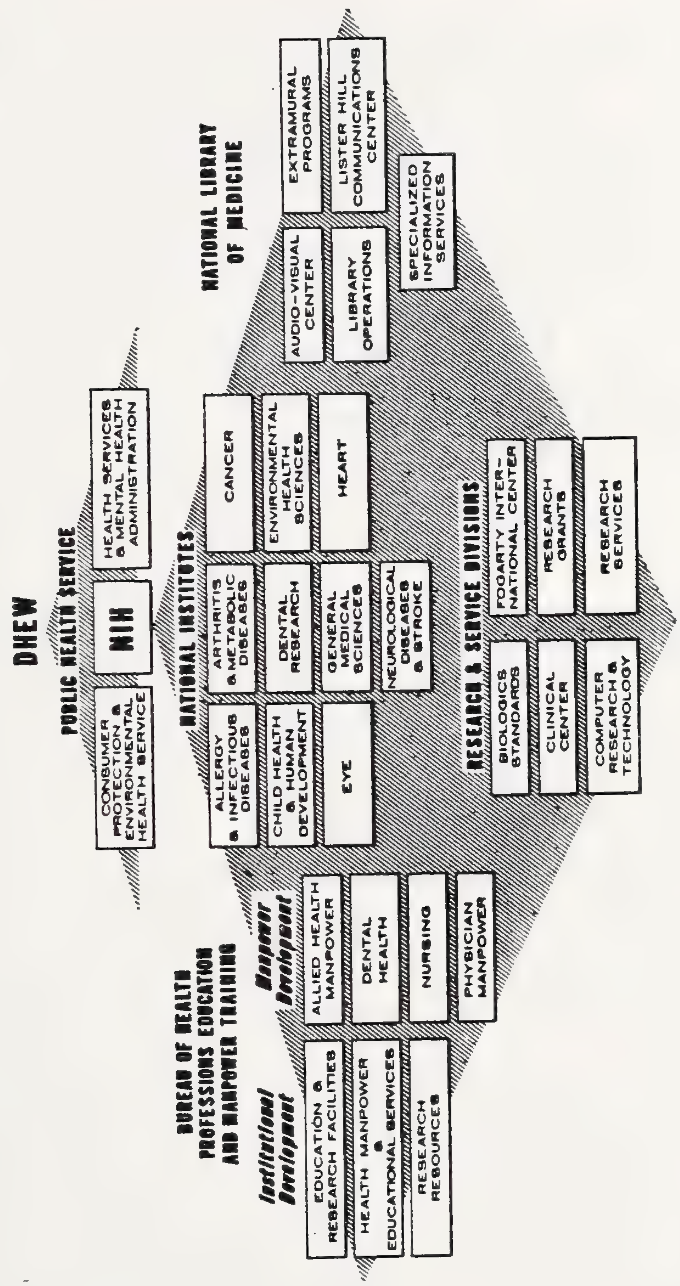
I should like to point out that if the proportion of Federal support to higher education should in the next few years increase from the present one fifth to, say, one third, then the method chosen to distribute the additional support becomes very important. This will be debated in Congress and in your institution over the next few years. I firmly believe we must distinguish clearly between the Government's role in the support of education and its broader responsibility in meeting societal needs. And I emphasize again my serious concern about the dangers of blunting two of our most effective tools for change—research and education—in a belated recognition of the magnitude of our societal problems. As I pointed out earlier, the social pendulum has already swung far and will probably swing farther.

I should like now to talk about some of the tools we have to work with in the Federal Government—specifically those relating to research and education. One thing we have is a very flexible system. I say this somewhat with tongue in cheek, in view of the number of reorganizations that have occurred in the Public Health Service in recent years. But more seriously, the transformation covers the whole period since World War II, when broad support for biomedical research under Federal auspices became an established public policy. There have been numerous changes in that time. The reorganization carried out last April consolidates the operational activities in three major agencies, as shown in the following chart.

The Consumer Protection and Environmental Health Service is responsible for major activities in the environmental health area and includes such programs as that of the Food and Drug Administration. The Health Services and Mental Health Administration includes direct services to Federal beneficiaries, all the responsibilities of the Public Health Service in the area of mental health, and three new activities—Regional Medical Programs, Comprehensive Health Planning, and the National Center for Health Services Research and Development.

The third major component of the Department's health establishment is the National Institutes of Health, composed of ten National Institutes, with supporting research and service divisions. Added to these traditional activities is the new Bureau of Health Professions Education and Manpower Training. This covers physician manpower, allied health, and the dental and nursing fields, funded through grants for construction, student assistance, and basic and special improvement awards to institutions. The National Library of Medicine is also part of NIH, providing leadership in extending the concept of the modern medical library from a mere repository for books to a broad biomedical communications service.

The mission of the National Institutes of Health is to improve the health of the American people through support of research, research training,


DHEW
PUBLIC HEALTH SERVICE
CONSUMER PROTECTION & ENVIRONMENTAL HEALTH SERVICE
NIH
HEALTH SERVICES & MENTAL HEALTH ADMINISTRATION
BUREAU OF HEALTH PROFESSIONS EDUCATION AND MANPOWER TRAINING
Institutional Development
EDUCATION & RESEARCH FACILITIES
HEALTH MANPOWER & EDUCATIONAL SERVICES
RESEARCH RESOURCES
Manpower Development
ALLIED HEALTH MANPOWER
DENTAL HEALTH
NURSING
PHYSICIAN MANPOWER
NATIONAL INSTITUTES
ALLERGY & INFECTIOUS DISEASES
ARTHRITIS & METABOLIC DISEASES
CANCER
CHILD HEALTH & HUMAN DEVELOPMENT
DENTAL RESEARCH
ENVIRONMENTAL HEALTH SCIENCES
EYE
GENERAL MEDICAL SCIENCES
HEART
NEUROLOGICAL DISEASES & STROKE
RESEARCH & SERVICE DIVISIONS
BIOLOGICS STANDARDS
FOGARTY INTER-NATIONAL CENTER
CLINICAL CENTER
RESEARCH GRANTS
COMPUTER RESEARCH & TECHNOLOGY
RESEARCH SERVICES
NATIONAL LIBRARY OF MEDICINE
AUDIO-VISUAL CENTER
EXTRAMURAL PROGRAMS
LIBRARY OPERATIONS
LISTER HILL COMMUNICATIONS CENTER
SPECIALIZED INFORMATION SERVICES

education in the health fields, and biomedical communications. The present budget is of the order of $1.4 billion, and in my opinion there is compelling justification for additional funds in each of the above areas.

Research conducted by or supported through NIH has evolved over the last few decades as a joint venture between the Federal and the non-Federal components of our society. I should like to discuss this relationship briefly as it operates in NIH grants programs. No grant can be made without approval of a nongovernmental National Advisory Council, which bases its decisions on a detailed analysis of the research proposal. This analysis is carried out by study sections, composed of the Nation's best experts. Whether measured by formal studies such as that of the Wooldridge Committee, or by the judgments of our colleagues abroad, or by general consensus, the national investment in biomedical research and its impact on education and service have been good. However, as research expenditures climbed steadily in the 1960's, claiming a larger proportion of the Federal dollar, and as the need for direct support of education and for massive health service expenditures became increasingly apparent, persistent questions of policy have arisen.

One such question arose last summer concerning so-called "moral commitments" for on-going research funded through grants. Because of budget constraints, we found it imperative to negotiate with individuals and institutions a reduction in our grants programs averaging 15 percent. This was undoubtedly a shocking experience to university scientists, and the question it raises for all of us is whether a better system can be designed to support research, education, and service—one that will give more predictability of support over a period of time. We are faced with a dilemma. If we adopt a formula approach, we lose the unique strength of our present system: the ability to identify excellence and to support it by virtue of the peer judgments of our advisory groups. Let me say here that I strongly support the project-grant system as one method of supporting science, but I think we must explore other ways of aiding and stabilizing institutions and large programs.

Budget constraints pose another problem for science—that of striking a reasonable balance between the support of basic research and of developmental or applied research. We must not forget that most of our insoluble problems in medicine are not amenable to a target approach. Such problems can be successfully studied only through free-ranging inquiry of a long-term nature. At this point in history the fashionable and glamorous programs tend to be in the areas of health service. But it would be a fatal mistake to support those at the expense of research. The same can be said of any effort

at this time to divert present inadequate resources supporting medical education into programs directed toward broad societal needs.

Let me summarize my thoughts about the present role of health-related academic institutions. The cumulative effect of changes in the last two decades has resulted in a broadened concept of the health professions' educational institutions in this country and of what we expect of them. The university medical center has assumed major responsibility for the education of future generations of scientists, teachers, and practitioners. Other prime obligations are the acquisition of new knowledge, both basic and applied, and the provision of a standard of health care in the community.

As society becomes more and more dependent on the university medical center as a major resource for improving health and the quality of life, the center, in turn, becomes more and more dependent upon the Federal Government for financial support. One of our most formidable policy issues is how to enable the Government to contribute effectively to the support of this complex enterprise which is absolutely indispensable to the practice of good medicine and the maintenance of high health standards. Finding the answer to this problem is of vital concern to all of us, and particularly to the young who must assume the leadership of tomorrow.

Summary of Discussion following Lecture

Q: *It seems to us that the present pattern of Federal support discriminates against medical students—that they are the ones who are unable, for example, to obtain fellowships. Is there any reason why this cannot be changed?*

A: The statutes providing for general support of health manpower training are of very recent origin, and their impact in terms of increased enrollment and graduates is just beginning to be felt. Nonetheless, we can report that under the Health Professions Educational Assistance Act, 23,000 students have already received loans and 14,000 students have benefitted from scholarships. This law has also provided basic improvement grants to 172 schools, and construction assistance to 20 new schools and 105 other schools. So a start has been made.

Q: *What is the point of all our present emphasis on research if we are not going to develop the means to apply this knowledge in the practice of medicine? Should not more attention be given to improving health care rather than concentrating on research?*

A: First of all, I think we must see this problem in perspective. The total annual cost of health care to the Nation is in the order of $50 to $55 billion. The portion devoted to medical research is only about $2.5 billion, or 5 percent. I think this makes clear why the need for more money

to augment health services cannot be met by merely shifting dollars away from research and education. Let me put it another way. If our total national expenditures for medical research were applied to the delivery of health services to the citizens of New York State, it would have no appreciable effect. Robbing Peter to pay Paul is as shortsighted in medicine as in other endeavors.

Q: *There seems to be more emphasis today on training programs for research than on training programs for physicians in the service area. Is there an imbalance here?*

A: In certain fields where shortages of medical personnel are particularly acute and plainly urgent—anesthesiology and psychiatry, for example —the Federal Government has been providing substantial support for some time through programs aimed at increasing the number of specialists in medical practice. I think it is fair to say that your awareness of broadly supported manpower training programs is certain to increase in the period ahead. Remember that the legislation in this area is of quite recent origin. The Health Professions Educational Assistance Act was passed in 1963, the Nurses Training Act in 1964, the Allied Health Professions Training Act in 1966. And only in the past year were these activities transferred to NIH, when education and biomedical communications were made part of our mission.

Q: *Have you given any thought to the concept of supporting research on a broad basis without reference to disease relevance, and where scientists can work on problems of their own choosing?*

A: Yes, we have. We established within NIH in 1958 a Division of General Medical Sciences, now a National Institute. This is noncategorical in nature and principally devoted to the support of basic research. Most of our research activities, however, are organized along categorical lines, and the names of the Institutes designate the disease or diseases under investigation. We believe the growth of NIH in the postwar period indicates that the pattern of categorical support for research has been a sound and productive one. Congress has shown its confidence in a disease-oriented research program while also authorizing and supporting our National Institute of General Medical Sciences.

TAB 12

Draft Remarks - Director, NIH
Congressional Women's Group
Clinical Center - February 28, 1969

I am particularly glad you came to visit us here at the National Institutes of Health. Since World War II, the American people and their representatives in Congress, with a degree of optimism and informed judgment, have made a tremendous investment in the future health of the nation and the world. Today, appropriations to the National Institutes of Health amount to one and one half billion dollars per year. We have 12,000 employees. It is important for you to know how the money is spent and of any successes that we are having.

Until about 11 months ago, the National Institutes of Health was primarily concerned with research--trying to find ways of lengthening life and lessening pain. Today we are still concerned with these goals. We have 10 research institutes and 4 divisions for the task, and in addition the unique research hospital in which you are now seated, the Clinical Center.

In April of last year, the Secretary of Health, Education and Welfare added the organization that is now known as the Bureau of Health Professions Education and Manpower Training. It seeks to increase the supply of trained women and men who can make direct use of the ever increasing fund of knowledge for improving the health of our citizens.

In the same move the National Library of Medicine became a part of NIH. It is primarily concerned with biomedical communications--not only among research scientists but to others in medical practice who need the new information. That's a fantastic task alone, and it's being done very successfully.

why?

I think you are probably interested primarily in the health research mission of NIH, and so I shall talk about that primarily today.

There is a strong temptation in a meeting such as this one to tell of advances made against the killers: cancer and heart disease. Indeed, federally fostered research and development has transformed the outlook for many persons who suffer from these troubles. As an example, I think of a technique developed here at NIH for relief of angina--that's the pain in the chest region that is brought on by exercise or by emotional strain. In some persons who were suitable, our heart specialists have implanted a device under the skin, and when these persons feel the pain of angina, they can press a button and literally kill their own pain. An artist who could hardly lift his brush because of heart pain is now back at work. I also think, for example, of Hodgkin's disease, a type of cancer that has been regarded as incurable, and of the dramatic advances against it. Today, as a result of modern therapy, patients with Hodgkin's disease may lead normal, productive lives for a number of years. In some individuals the disease has been completely eradicated in this very building in which you are now seated.

But I shall speak of other things--

--of the development of a vaccine against German measles, because of some exciting meetings that were held in this auditorium last week.

--of the use of a drug L-DOPA against Parkinson's disease, because it involves difficult policy decisions that I think you should know about.

--of the hope that we have that tooth cavities can be eliminated within 10 years, because this is a matter that concerns everyone.

German measles--another name for it is rubella--causes birth defects if a mother-to-be gets the disease in the early part of her pregnancy. Most of you know of the tragic epidemic of 1964 and 1965 and of the fact that 20,000 infants were born with such crippling defects as mental retardation, heart disease, blindness and deafness. Even in non-epidemic years, German measles causes thousands of birth defects and abnormal pregnancies.

I wish you could have been in this auditorium last week. We had four hundred scientists from 27 countries. The spirit was one of triumph. They heard reports on the testing of German measles vaccines in about 50,000 children and some adults. The reports were glowing ones. There are still some matters to be resolved, such as the best medium to use for growing and weakening the virus, but we are so far advanced that I can tell you today:

--we will have a German measles vaccine licensed soon, within a matter of months, I firmly believe;

--within a very short number of years, German measles will have been ended as a threat to our unborn children.

The conference that was held here last week demonstrated beautifully the "one world" of scientific investigation and progress. The evidence that was presented, the scientific judgment exercised, and the conclusions reached were independent of time, geography or personal wish, bias, or prejudice. The conference demonstrated the massive voluntary cooperative partnership among the leading pharmaceutical companies, university medical centers, industrial research laboratories and the Federal Government.

The German measles vaccine was isolated in 1962. By 1963, two doctors at the Division of Biologics Standards here at NIH had developed a live virus experimental vaccine. By October 1965 they were ready for their first trial on 16 girls. These doctors also developed a fast and reliable test for measuring immunity to German measles. During the same period, scientists in drug companies and in other countries were working on vaccines.

By 1966, we were ready for an intensive program of vaccine development. It was undertaken under the guidance and sponsorship of the National Institute of Allergy and Infectious Diseases, one of the ten NIH institutes. Now I wish to emphasize this point: the work has been carried out in cooperation with scientists and industry throughout the country. Indeed, this is the way NIH works--this is the reason, I think, why it has been so successful. Most of the money appropriated by the Congress is not spent here on this reservation. Most of it is spent in a great partnership effort, involving the best brains everywhere.

There soon followed vaccine tests on 9,000 school children on the Nationalist Chinese island of Taiwan and other field trials in the United States, and today we are almost ready for that great adventure that I spoke of--the eradication of one more disease threat to the human race.

And now I wish to speak of a drug called by its short name L-DOPA and its use in Parkinson's Disease--a disease that affects age groups at the opposite end of the spectrum from rubella. The subject involves the challenging question: just how far do we test a drug before making it available to the American people through their physicians?

Parkinson's is the disease that many persons call "shaking palsy." It progresses into tremor and rigidity, affecting speech and the ability to swallow. It can erase the bright and alert expression on a person's

face. We do not know the cause of Parkinson's and we have no cure for it, although surgery has helped some patients and careful management by doctors has helped a great many.

Here at NIH, the National Institute of Neurological Diseases and Stroke has supported research on Parkinson's Disease at Columbia University since 1963. This institution has been a leader in identifying the potential of the amino acid L-DOPA in Parkinson's. By 1968 it was apparent that L-DOPA could result in symptomatic relief for 75 percent of those who had Parkinson's Disease of a severely disabling nature.

Despite this, there are problems of supply and of rather serious and unpleasant side effects. Last September, the Clinical Therapy Advisory Committee of the neurological institute recommended that we undertake a national cooperative study. We adopted the approach. We intended to study 600 to 700 persons at 20 institutions for a period of three years, at a cost of one million dollars a year. At the end of the first year, we hoped, we might be able to have information leading to a decision whether the drug might be released to all physicians.

However, as a final step we convened a study group, composed of specialists outside NIH. It is a rather routine step to seek advice from throughout the scientific community, and in this case we wished to especially sure before proceeding. This study group believed that enough data, from treatment of patients already made, might be available. Consequently, today data on some 350 patients already tested with L-DOPA is being collected and anlyzed on a uniform basis.

You will be aware, I am sure, that this has been a most difficult decision. The NIH is prepared to undertake whatever action is necessary--based on sound scientific evidence--to advance the investigation and eventual general use of L-DOPA. Our present approach to the study of L-DOPA should not delay chances for making the drug available at the earliest date possible. It may even make it available earlier than if we had pushed through with the more elaborate study. But the story has dramatized for us once again the question of when in this process we move from pure acquisition of new knowledge to the public policy decisions so necessary to the application of that knowledge.

And now for a smiling note. We hope in 10 years that every child in America can say, "Look ma, no cavities." New discoveries are showing us ways to conquer tooth decay, a disease that affects 98 percent of all Americans.

You know of course, that fluoride reduces tooth decay. Research sponsored by the National Institute of Dental Research shows that good results follow when a fluoride gel is applied experimentally to a person's teeth in a plastic mouthpiece for a few minutes a day. Even more promising is the use of an enzyme called dextranase. It fights the plaque that bacteria deposit on the teeth. It is this plaque that causes tooth decay.

The main concern for the National Institutes of Health is improving the health of the American people and, indirectly, the people of the world. Within our overall mission, we are moving on many fronts against many diseases that trouble mankind. Today, I have touched on three specific fronts--German measles, Parkinson's Disease, tooth decay.

We are grateful that our country and its representatives put health where it deserves to be--in a position of primacy among our national efforts.

We are grateful to have an opportunity to work on what I believe to be some of the most exciting developments of our times.

And we are grateful to each of you for visiting with us today and for giving us the opportunity to discuss our work and show you some of our activities. Thank you.

TAB 13

#610

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Statement by Director, National Institutes of Health

on

1970 Appropriation Estimates

Mr. Chairman and Members of the Committee:

I am pleased to have the opportunity to appear before you this year in a new role. Although my association with NIH is not new --I first worked there in 1951 and, more recently, served for nearly three years as an Associate Director of NIH and as Director of the Regional Medical Programs while that was part of NIH--I have been the Director of NIH for only six months which is a very short time for a post that during the past 81 years has had only 8 incumbents. However, the newness of my role here today is not due primarily to my own recent appointment but to the fact that I am here to testify about the goals, plans and needs of what is, in fact, a new organization, operating in a new departmental framework, under a new administration.

As a result of the reorganization of the health functions of the Department that was announced last April, NIH is now not only the mainstay of biomedical research in this country but also has responsibility for Federal support of education in the health professions and for biomedical communications. The new NIH consists of three major components:

... the research Institutes and Divisions--to which we still sometimes refer, collectively, as 'the old NIH';

... the former Bureau of Health Manpower which has been somewhat reorganized and given a new name--it is now the Bureau of Health Professions Education and Manpower Training; and

... the National Library of Medicine.

I should at this point, Mr. Chairman, like to introduce the top staff of the new NIH who are here with me today.

Dr. John Sherman is the Deputy Director of NIH.

Dr. Robert Berliner is the Deputy Director for Science and is also acting as Associate Director for Direct Research.

Dr. Leonard Fenninger is the Director of the Bureau of Health Professions Education and Manpower Training.

Dr. Martin Cummings is the Director of the National Library of Medicine.

Dr. Ronald Lamont-Havers is the Associate Director for Extramural Research and Training.

Mr. Richard Seggel is Associate Director for Administration.

Dr. Thomas Kennedy is Associate Director for Program Planning and Evaluation.

The three major components of NIH have distinct but complementary functions. The Surgeon General, in his testimony, has already described the considerations that led the Department to bring these activities together. Let me just repeat the principal reason

which was succinctly stated in the Department's press release announcing NIH's broadened authority and new role. It said:

> "Modern biological science and health professions education are so intimately inter-related that their effective and efficient management within this Department requires that they be the responsibility of a single operational unit. This will now be the NIH."

This intimate relationship is partly due to the fact that biomedical research and health professions education are largely carried out in the same institutions. For the most part, they require the same kind of facilities and depend on people with the same professional qualifications.

While the interplay of research and graduate education is helpful to both, it is not equally helpful to both. It is possible to perform first class research in an institution which has little or no responsibility for formal education. In fact, NIH's own intramural research activity at Bethesda is an outstanding example of such an institution. However, it is not possible to provide a first class professional education for scientists in an institution in which little or no research is conducted. Especially at the more advanced levels of professional education, the methods, techniques, and the intellectual discipline of research are an essential part of the educational process. Progress in most scientific disciplines is now so rapid that a new scientist--and I include physicians in that term--must have a keen awareness of the directions of research in his field. His

exposure to the potentials and limitations of research must begin as an integral part of his professional education. In fact, as a well-known physician has pointed out, "the faculties developed by doing research are those most needed in diagnosis".

Our efforts to harmonize effectively the support for biomedical research and education must be undertaken under the cross-fire to two fairly common criticisms on which I should like to comment. One of these criticisms is that the support now available for research has unbalanced the academic community and detracted from the performance of its educational function. The truth is that the academic community is out of balance in the same way that a man who has thrown one foot forward is out of balance. If his objective is to take a step forward, he must obviously restore his balance by bringing the other foot forward too. It is true that we have thrown the research foot well forward. The imbalance in the academic community is not due to too much research support but to the unfortunate fact that, until recently, this has been the sole kind of Federal support available. There is a clear and urgent need for comparable educational support. As you know, the Health Professions Education Act of 1963---and its amendments and supplementary legislation--are designed to provide this sort of support. It is part of the new role of NIH to restore balance by bringing the educational-support programs into line with research-support.

The other criticism often heard today is that research is enticing physicians from the practice of medicine. Let me counter that with some facts.

In the first place, most of the laboratory research in biomedicine is performed not by MDs but by PhDs who are not licensed to provide health care. At NIH, for example, nearly half of the professional staff with doctoral degrees hold some degree other than an MD. Nearly 70 percent of our research grants are for projects on which the principal investigator is not an MD.

Actually, the number of physicians who are mainly engaged in research is surprisingly small. The American Medical Association has just published a statistical summary of the major professional activities of medical school graduates who were living on December 31, 1967. This study shows that of the 296,400 graduates who were still active, 93 percent were engaged in patient care. The other 7 percent was mainly accounted for by 11,400 physicians who were members of medical school faculties and 4,240 who were engaged in administration. The glaring fact is that only 4,726 physicians--or 1.6 percent of the total--had research as their major professional activity. While it is, of course, true that some physicians, especially those on medical school facilties, combine research with their other activities, it is noteworthy that of all the physicians who are <u>not</u> primarily engaged in patient care less than a quarter list research as their major activity.

Physicians engaged in research are, with very few exceptions, engaged in clinical research which <u>must</u> involve a physician. As clinical research is, by its very nature, a combination of research and patient care, the research-physician has not withdrawn from practice. He is probably providing more intensive and higher quality care for his patients than they would receive if he were not engaged in research.

Finally, it is usually true that a physician of the caliber required for successful competition for research-grant funds could make more money if he devoted himself solely to practice in his specialty. He has certainly not been enticed into research because there is money in it. On the contrary, he is in research because he has intellectual curiosity---and, probably, unique talents for research ---and because he hopes to make a fresh contribution to the solution of disease problems. A research grant enables him to do this effectively by making the necessary resources available but it provides neither the initiative nor the motivation.

The growing awareness of the problems in health professions education and, especially, of the deficiencies in the provision of health-care services in this country has understandably diverted attention from the importance and needs of biomedical research. In fact, in some quarters the pendulum has swung so far that research is viewed as an expensive hobby that must give way to more urgent needs. This strikes me, Mr. Chairman, as a little like saying that the goose that lays the golden eggs should no longer be fed.

The ultimate purpose of all health activities must be the prevention or cure of disease---and, when neither of these goals is yet attainable, the amelioration of the effect of disease both in terms of extending the useful life of the patient and of minimizing disability and suffering. This is indeed the purpose of all of the programs supported by the NIH appropriations.

Effective action against disease requires, first of all, a knowledge of what is wrong and the availability of some means for doing

something about it. In general, the better our understanding of the cause and usual course of disease, the more likely it becomes that we will be able to develop some means of coping with it. That, in essence, is the purpose of biomedical research: the constant expansion of knowledge and its translation into applicable preventive or therapeutic methods.

During the past decade NIH has contributed to the expansion and strengthening of every major health institution in the country. Almost every major medical advance in this country has to some extent depended on research supported by NIH. Almost every citizen has benefited --and will continue to benefit--directly or indirectly from these research programs.

In fact, research during the past decade or two has completely changed the practice of medicine. Most of the drugs now in common use for the treatment of major diseases were unknown or unrecognized as therapeutic agents when I started medical school in 1943. A whole series of new surgical techniques have been developed that make it possible to intervene in situations in which surgeons used to be unable to help. New and better techniques for monitoring patients and for automating laboratory tests have been developed. Mechanical assistance devices then unknown--such as the pacemaker and the so-called artificial kidney, which is actually an external blood-cleansing device--have already saved thousands of lives. You are well aware of recent dramatic advances in the technology for transplanting human organs. All these radical changes in the practice of medicine--and the certain expectation of ever more revolutionary advances--are the direct result

of the expansion of research facilities, the enlargement of the corps of research scientists, and the provision of funds to support their work. The greater effectiveness of modern medicine is the tangible pay-off for the investment that has been made in medical research.

This Committee has just heard testimony in support of a request for funds to launch a large-scale vaccination program against German measles in order to head-off the next epidemic. The last epidemic resulted in the birth of some 30,000 children with serious congenital defects. The effort to forestall a repetition of such a tragedy was made possible by a concerted research effort since the last epidemic. Not only did NIH provide a major share of the support for this research but NIH scientists, working in the laboratories at Bethesda, made major contributions to the development of the vaccine.

I shall leave to the witnesses who will testify for the appropriations of the various research Institutes the pleasant task of reporting to you on significant progress in research against some of the major diseases. At this point, it is, I think, more important for me to emphasize the serious and bewildering gaps that exist not only in our knowledge of diseases but in our understanding of the intricacies of normal biological processes.

Despite the impressive---and often dramatic--progress that has been made in the prevention, diagnosis and treatment of many diseases, the art of medicine is still a rather primitive science. In fact, a frequent consequence of new advances in knowledge is to raise even more difficult questions or to expose new areas of ignorance. This state of the art lies behind our constant insistence on the importance

of what, for want of a better name, is usually called 'basic' research. Basic research is not the opposite of applied research, as so many people seem to think. Basic research is the essential first stage of exploration in a new area. It is basic research that makes so-called applied research possible. With rare exceptions, the practical advances of today are the fruit of basic research done over a considerable period of time by a number of different investigators. I am absolutely certain that any slow-down in basic research will be directly reflected in the postponement of solutions to many disease problems. It is particularly important, in an era of restricted budgets, not to lose sight of the indispensable role played by basic research in achieving the objectives of the NIH programs.

I have talked about research at some length but I can sum up my view very briefly. Research is the root on which all other health activities grow. Without that root, no further growth is possible --either in improving the quality of education or the quality of medical service. The old adage that 'knowledge is power' is nowhere more applicable than in the practice of medicine and, as Sir Howard Florey, the developer of penicillin, has said "the lesson of twentieth century medical science is ... that experiment is the most efficient method of acquiring new knowledge".

However, knowledge is useless unless it is properly applied. The second requirement for effective action, therefore, is highly trained professional personnel.

I have already touched on the urgent need for a more vigorous attack on the manpower shortage in the health professions. Since the

beginning of this century the production of physicians has barely kept pace with our growing population. The number of physicians, in proportion to population, is no better now than it was in 1900. At the same time, the need for highly trained physicians and other health personnel has grown sharply as the result of two factors. The first is the greater sophistication of medical practice and the consequent growth of specialization. As a direct result of research, the medical profession is able to deliver care that is infinitely superior to what was possible in 1900 but it takes more--and more diversified--manpower to do it. The second factor is the rise in public aspiration for health care and the consequent rapidly growing demand for high quality professional services. To this we must add, as a third factor for the future, the demand arising from programs designed to bring better health services to the aged and the disadvantaged and to make the best medical care that is technologically possible readily accessible in all parts of the country. The need is thus for a greater number of better trained people in all of the health professions.

We are now in the stage of having to raise our national commitment to medical education to a higher plateau during the 1970's as we raised biomedical research during the late 1950's and early 1960's. The primary burden of doing this will necessarily fall on the Federal government--especially for training at the doctoral level. Medical and dental schools are, in a practical sense, national rather than local or even regional institutions. The AMA study to which I have already referred shows that more than 57 percent of the graduates of U.S. medical schools practice in a state other than the one in which they were educated.

Questions have been raised about the share of responsibility that the Federal government must assume for the training of nurses and the allied health professions. It is, of course, true that facilities for training nurses and health technologists are more geographically dispersed than medical or dental schools and that their graduates normally find local employment. It has, therefore, been argued that nurses and technicians constitute a state or regional--rather than a national--core of service personnel and that their training might well be regarded as primarily a state or regional responsibility. However, shortages in these professions are no less acute than the physician shortage and the existence of an adequate number of well-trained nurses and other supporting personnel is no less a national need. Moreover, new national programs such as Medicare, Comprehensive Health Planning, the Regional Medical Programs and the Model Cities program are major factors in greatly increasing the demand for auxilliary health personnel. It is therefore both necessary and appropriate for the Federal government to stimulate and assist the development of suitable training programs for allied health personnel. This is, indeed, the purpose of the institutional and special project grants and the traineeship, scholarship and loan programs authorized by the Nurse Training Act of 1964 and the Allied Health Professions Personnel Training Act of 1966 and subsequent legislation.

A particularly urgent problem, to which the Secretary has already referred in his testimony to this Committee, is that a number of our medical and dental schools are having serious financial difficulties. The viability of these schools is a matter for serious concern at a time

when we are not only faced with a critical manpower shortage--and are, in fact, in process of establishing additional medical schools--but when urgent social needs are making increasing demands on them.

A more adequate and stable form of institutional support, than now exists, must be provided if the medical, dental and other professional schools are to rise to the challenge that national societal and manpower needs have placed before them. Such support should not simply be designed to relieve current financial stresses but should have the more important aim of restoring confidence in the Federal government's long-term policies in regard to the support of biomedical research and education. This confidence has, unfortunately, been shaken by NIH's inability, for budgetary reasons, to carry out the intentions of the 1966 extension of the Health Research Facilities Construction Act and by the necessity, in order to effect the required reductions in 1969 expenditures, to dilute its long-standing 'moral commitment' policy by renegotiating grant awards that had already been approved.

The close and mutually dependable relationships that have been carefully built up between the principal centers of biomedical research and training and the categorical Institutes are a valuable, if intangible, asset. They have been a major factor in the rise of this country's biomedical research effort to its present preeminence. They are no less important to the smooth evolution of the important health manpower programs that are now in their initial stages. I am convinced, Mr. Chairman, that the success of the Federal government's partnership with non-Federal institutions in such national programs depends largely on two conditions

... the predictability and reliability of Federal assistance; and

... the feeling of common purpose and professional rapport that exists between the institution and the Federal agency with whose programs it is involved.

I believe that these conditions are, in the long run, more important than the actual funding level.

The immediate purpose of institutional support for medical and dental schools under the health manpower appropriation is to make possible--and provide an incentive for--substantial increases in enrollment. As you know, most of the schools, for quite understandable and legitimate institutional reasons, have in the past resisted moving in this direction. There has, however, been a profound change in attitude and there is no longer any reason to doubt that this program will succeed to the extent that resources for it become available during the next few years.

A longer-range purpose of these institutional grants is to facilitate the development of more efficient and effective educational processes in institutions which have diverse aims and capabilities. New approaches in medical education are desirable for three reasons. First, simply in order to accommodate a larger number of students without a proportional enlargement of facilities, faculties, and funds. Secondly, in order to maintain quality standards during a period of fairly rapid expansion --and, if possible, to raise them. As someone has said, it would be wonderful if we could double the number of schools in the top 25. And, thirdly, in order to prepare students to experiment with changes in the delivery of health services such as the greater use of auxilliary personnel for some of the activities that now absorb too high a

proportion of the average practitioner's time but that do not require his extensive--and expensive--training.

The third prerequisite for effective action against disease problems is the constant flow and the ready accessibility of the products of research to the people who are in a position to use and apply them. This is largely a question of communication which, as yet, presents many problems. One of the principal functions of the National Library of Medicine is to provide imaginative leadership in the development of new techniques for the storage, retrieval and dissemination of biomedical information.

Communication of research information is the gateway to its application and it is the most reliable device for constantly enhancing the quality of service to the patient. Communication provides the essential links between research, education and service. It is no less important to the maintenance of a high standard of training. It provides the cross-fertilization that greatly increases the yield of research.

The National Library of Medicine, which is now part of NIH, plays a major national role in biomedical communication. Last year the Congress passed a bill authorizing the establishment and construction of the Lister Hill National Center for Biomedical Communications as part of the National Library of Medicine. A request for $900,000 in planning funds for the construction of the Lister Hill Center is included in the budget estimate. The purpose of the Center will be to provide--in the language of the bill--"an urgently required facility for the improvement of communications necessary for health education, research and practice". It is hoped that the Center will be able to provide leadership for the

rapid development and standardization, on a nation-wide basis, of the technological aspects of biomedical communication, information systems, and network projects.

This Committee will be pleased to hear that we are making good progress in creating the John E. Fogarty Center for Advanced Studies in the Health Sciences. A contract for the design of the building was signed last December. The plans are due to be completed by April of next year and we hope that a request for construction funds will be included in the 1971 budget estimates. Meanwhile, the restoration of Stone House is underway and will be completed by July of this year. Stone House, which was the residence of the former owners of part of the NIH campus, is a substantial and attractive building on the site chosen for the Fogarty Center. It will become a permanent part of the Fogarty Center facilities. Dr. Leavitt, the Director of the Center will report to you later in these hearings on the programs of this memorial to the late Congressman Fogarty.

I have touched briefly on the major responsibilities of the new NIH. All of the wrinkles have not yet been ironed out of the new organization and a number of administrative problems remain to be solved. In developing the new organization we shall strive for the best balance among the various activities always bearing in mind that their ultimate purpose is to achieve the most effective approach to the prevention and cure of disease."

Last year when Dr. Shannon made his last appearance before this Committee as Director of NIH, he described the budget estimates as "Spartan in character" and as "necessarily limited ... to the amounts

that can be justified as essential if the medical research establishment of the nation is to be maintained at an effective level and not be threatened with disarray and deterioration". The budget request now before you is no less Spartan and no less limited to the absolute essentials.

The appropriations requested for NIH total $1,484,127,000 which is an increase of $90.1 million over the comparable appropriations for FY 1969. However, in terms of funds available for obligation---which takes into account carried-over funds that remain available for obligation in some of the NIH programs and restrictions on obligations during FY 1969---the net increase for NIH is only $31.7 million or slightly more than two percent. The funds requested are distributed as follows among the major activities of NIH:

... The $275.6 million requested for direct operations of the Institutes and Research Divisions includes $89.2 million for the conduct of research by the NIH scientific staff and $127.4 million for collaborative projects. The remaining $59 million is for other direct operations, program direction, administrative services and management of the extramural program.

... Of the $634 million requested for research grants, nearly $170 million is for the special research grant programs --including $53.6 million for General Research Support --and $331 million is for non-competing research projects which we already have a commitment to support. This leaves $133 million for competing grant applications--an increase

of $6.3 million over the amount available for FY 1969 mainly for the new Eye Institute and for family planning research.

... The requests for training grants and fellowships total $190 million--a decrease of $7.7 million from the amount available for FY 1969.

... $245.5 million is requested for the health manpower programs --an increase of $38.8 million over the comparable figure for FY 1969. A little over half of this amount ($123.9 million) and $30.4 million of the increase is for the institutional support programs.

... $11.9 million is requested for dental health activities which is an increase of $1.7 million.

... For the construction programs, which are now combined in the Bureau of Health Professions Education and Manpower Training, the budget request is $126.1 million. Together with carry-over funds, this will make $149 million available for obligation which is nearly $25 million less than the comparable figure for FY 1969. An increase of $10.8 million is allowed in the construction funds requested for medical schools but this is more than off-set by a $10.8 million reduction in construction funds for schools of nursing and by the absence of any request for funds for the construction of health research facilities, medical libraries or allied health professions schools.

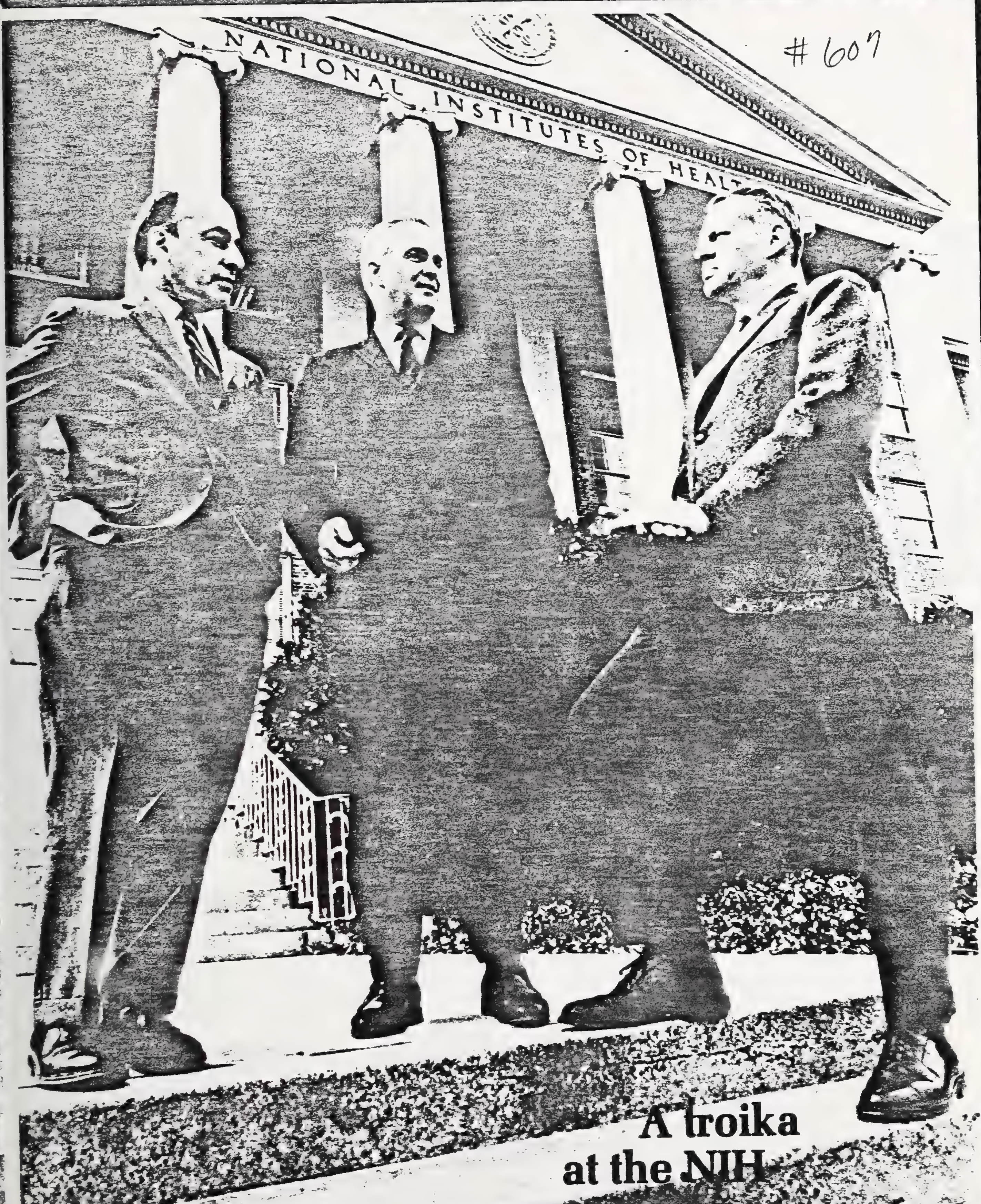
... $22.2 million is requested for the National Library of Medicine which, with carry-over funds, will result in an increase of $2.7 million in the amount available for obligation. The increase is mainly for operating the library and for the activities of the Lister Hill Center. The amount included for grants ($7.6 million) is slightly less than the comparable amount for FY 1969. In addition, $900,000 is included in the budget item for Buildings and Facilities for architectural planning of the Lister Hill National Center for Biomedical Communications.

These figures admittedly do not make full allowance for everything that could, or should, be done. Health activities--important though they are--must, like other important social programs, continue to be limited by over-riding economic constraints. The funds requested do, however, provide for the maintenance of commitments in almost all program areas and allow for modest expansion in some particularly urgent ones. The 1970 budget request is, like the 1969 budget, as lean as is possible without seriously curtailing the activities which it is designed to support. I hope, Mr. Chairman, that circumstances next year will permit resumption of a more vigorous pace for these significant health programs.

TAB 14

SCIENTIFIC RESEARCH

McGRAW-HILL'S NEWS MAGAZINE OF SCIENCE • MARCH 17, 1969



Washington

NIH tries troika leadership

Last December NIH Director Robert Q. Marston appointed Robert W. Berliner as his deputy director for science (a new post), responsible for all NIH research, grants and contracts—and John F. Sherman as his deputy director for administration. While the appointees are only deputy directors and Marston is still the titular head of the NIH, the three men will serve as a troika leading the NIH into a course that is likely to be considerably different from the James A. Shannon era. The days of great expansion at the NIH are over, say many Washington observers, and the need today is for steady research that promises payoffs.

When former NIH Director Shannon took over in 1955 the agency had seven Institutes and a budget of $71 million. By the time Marston was named director last summer the agency had 11 Institutes, its fellowship and traineeship programs had tripled, and the budget had skyrocketed to $1.2 billion. The NIH then acquired the National Library of Medicine and the old Bureau of Health Manpower. Its fiscal-1970 budget request is $1.54 billion.

Shannon, with his comprehensive knowledge of the NIH and long experience there, was able to run the agency alone without reorganizing it. But, in the view of knowledgeable NIH watchers, newcomer Marston would have been unable to match Shannon's performance and oversee the Library of Medicine and health manpower programs too without some administrative changes.

Hence the troika arrangement. "The responsibilities are not equally distributed," says Marston, "but my two deputies have been given a great deal of power in their areas. Sherman has broad responsibility across NIH; Berliner . . . as my alter ego . . . makes decisions and makes judgments for me in the area of research—among the Institutes.

"They are my two hands. When I sit with the research staff, Berliner is on my left making his contribution. When I have to work out administrative problems or educational problems, Sherman is on my right," Marston says. In dealings with the Congress, Marston will make most of the journeys to Capitol Hill himself. But when he cannot go, either Berliner or Sherman will take his place.

All three principals are feeling their way in the new structure, but are happy with the arrangement. "There is a fair degree of uncertainty over how we are going to come out in this relationship. But it doesn't worry us. There is so much to do," says Sherman.

As deputy director for science, Berliner, who is 54 years old and an MD, sees his role as "attempting to evaluate the field [of research] and guiding the program of the Institutes. . . . " He is responsible for both intramural and extramural research, for the long-range planning of research policy, and also directs the NIH laboratories and clinics.

"Our approach," says Marston, "is to make sure we don't disassemble a really remarkable research institution which has been put together over the years. We have to put the highest priority on what will be most important for the future. . . . Berliner is the right man for this job and will . . . be carrying out the duties of the director in determining where we should spread our limited resources."

The directors of the 11 Institutes and two divisions and two centers work directly with Berliner rather than going to Marston for guidance, but they are free to go directly to Marston if they want to. "We wanted to avoid creating a layer between Marston and the Institute directors . . . but we needed someone to handle the day-to-day situation," Sherman explains.

Berliner will be responsible for

George Tames

A science "czar" for NIH: Robert Berliner (right) with his boss, NIH Director Robert Q. Marston

$1.039 billion of the NIH budget in fiscal '70. That figure includes $814.5 million for extramural research grants and fellowships, $85.5 million for laboratories and clinics, $121.3 million for collaborative research, $9.5 million for biometry and field studies, and $8.3 million for establishing biostandards.

Berliner believes that in times of budget stringency it is more important to keep the NIH in-house research teams together than to keep university research programs fully funded. "The intramural program is a real asset to the general medical research field in the country," he says, "and I think it would be most unfortunate to lose it. . . . It would be very easy, since we have no other functions than research, to damage the intramural program beyond repair—beyond early repair, anyway. It would be very difficult to put it [the NIH research team] back together again if it fell apart."

Asked which he would choose if he had to make a choice between intramural and university research, Ber-

liner replied, "It's a tricky problem to keep the thing balanced off. I don't think we have reached the point in either area that we have to make the choice . . . because . . . the cuts have hurt but they haven't been lethal to either activity. . . . Even though the '70 budget is tough, this will still be true next year."

The NIH is spending an increasing amount of money on health manpower problems but Berliner believes that research itself is the best long-term answer to health manpower problems. "I think you can't really accomplish much by taking money away from research and putting it into training health manpower . . . in terms of solving this health problem in the long run," he said.

Although officially satisfied with the 1970-budget request, privately Berliner feels that the NIH should have more money in order to maintain stability in its research. Inflation is one factor, but just as important, he says, is the ability to buy the new instruments necessary for progress in research. "I would estimate that it [the annual rate of budget increase] should be 7 or 8 percent at least just to maintain a level."

Of his new deputy director for science NIH Director Marston says, "We've taken one of the outstanding scientists in the country—with scientific and administrative experience."

"He is a superb scientist . . . a tremendous judge of research," says one associate. "Most of us are very pleased with his appointment," says another colleague, "because we feel we have someone who is fully aware of the intramural program and understands its needs. We are also pleased because [the appointment] brings to bear on our extramural programs a very excellent scientific mind; one whose judgment can be thoroughly trusted."

Last June physiologist Berliner was named director of all NIH labs and clinics after 15 years as director of intramural research at the National Heart Institute. Despite his new administrative responsibilities, he maintains an active role in research as chief of the Heart Institute's kidney and electrolyte metabolism laboratory. His studies of the body's potassium secretion and of electrolyte osmosis have led to a clearer understanding of the ion-exchange mechanisms that regulate the internal conditions of living organisms.

The importance and power of Berliner's new position may be reflected in the fact that his office is in the NIH director's suite. "It's not by accident that we share this office," says Marston.

LATE NEWS

This month's visit of five U.S. high-energy physicists to Serpukhov, the Russian 76-GeV accelerator, to open negotiations on a scientific level for a physics-exchange program, was very successful. But it remains to be seen whether the U.S. and Russian governments will set up a mutual exchange permitting U.S. scientists to work at Serpukhov and Russian scientists to work at American accelerators, including the 200-400-GeV Batavia machine. Wolfgang Panofsky, leader of the U.S. group and director of the Stanford Linear Accelerator Center, admitted that financial and administrative obstacles stand in the way of cooperation. "It takes about three times as much

Moscow welcomes U.S. physicists arriving for Serpukhov accelerator talks

work and . . . money for a U.S. physicist to do the same work [at Serpukhov] as back home," he said at Moscow's Sheremetyevo Airport just before returning. U.S. budget cutbacks are another stumbling block and may necessitate special U.S. federal funding if the exchange is to materialize.

The U.S. group inspected the 76-GeV machine and discussed both the current Russian research and possible future U.S. research with A. A. Logunov, director of the accelerator lab. Panofsky and his group will now make recommendations to the U.S. AEC for a program of research at Serpukhov. In addition to Panofsky, the group included Rodney L. Cool and Luke C. L. Yuan of Brookhaven, Thomas H. Fields of Argonne, and William A. Wenzel of Lawrence Radiation Lab, Berkeley.

Physicist/administrator Gerald Tape will leave AEC next month to resume the presidency of Associated Universities Inc., which operates Brookhaven National Laboratory and the National Radioastronomy Observatory, Green Bank, W. Va. Tape has been a member of the five-man Atomic Energy Commission since 1963. Authoritative sources say the Nixon Administration is looking for a scientist to succeed Tape and that one, physicist Norman Ramsey of Harvard, has already turned down the job. Ramsey is president of the Universities Research Association, which will operate the 200-400-GeV accelerator at Batavia, Ill.

MIT's March 4 "research stoppage" was a great success, say its organizers, and a miserable failure, say MIT administration spokesmen. According to the Union of Concerned Scientists and the Science Action Coordinating Committee, the organizations that planned the day, more than 50 percent of the students and about 50 percent of the faculty attended a day-long series of meetings devoted to the impact on society of the misuse of science and technology and the funding of research by the Defense Dept. "That is a gross exaggeration," said an MIT official. "Research activities at MIT were close to normal." He added that the on-campus Research Lab for Electronics and the off-campus MIT Lincoln Labs and Instrumentation Labs were only negligibly affected. All three are funded entirely by the Defense Dept.

REPRINTED FROM SCIENTIFIC RESEARCH
March 17, 1969.

TAB 15

March 24, 1969

Modern Medicine

DR. ROBERT Q. MARSTON

see Contemporaries page 14

Robert Q. Marston, M.D.

■ When Robert Quarles Marston left the relative serenity of life at the University of Mississippi in 1966 for the battlefields of Washington, he was almost immediately stamped as a man in the middle of a controversy. He had given up the job he loved as vice-chancellor and dean of medicine on the Jackson campus to direct the National Institutes of Health Regional Medical Programs.

The gray-haired Virginian was embarked on an uncharted course beset by roadblocks, not the least of which was the suspicion of many physicians that the Regional Medical Programs for Heart, Cancer and Stroke was encroachment by the federal government on the doctor-patient relationship.

But the 45-year-old medical administrator did not see his assignment in that way. He envisioned it as a program focused on patients and dedicated to improving the nation's quality of medical care. Most important, it was, by Congressional mandate, a program jointly financed by federal, state, and local funds, working through local facilities to improve treatment of heart disease, cancer, and stroke patients.

"The program provided very clear safeguards," he insists. "Before there could be any planning on the national level, there had to be approval by representative groups at the local level: they would run the program."

What it all boiled down to, Dr. Marston explains, was an attempt to find the best way to do things. Although the long-range program may require a decade to prove itself, he feels it has already come to grips with one major problem: uplifting clinical care by focusing on the wide variations in the quality of services from one section of a region to another.

"This business of bringing the fruits of advanced technology and research to the patient's bedside depends on a lot of people who have not sought to work together learning how to cooperate. And this has been a tough thing to do."

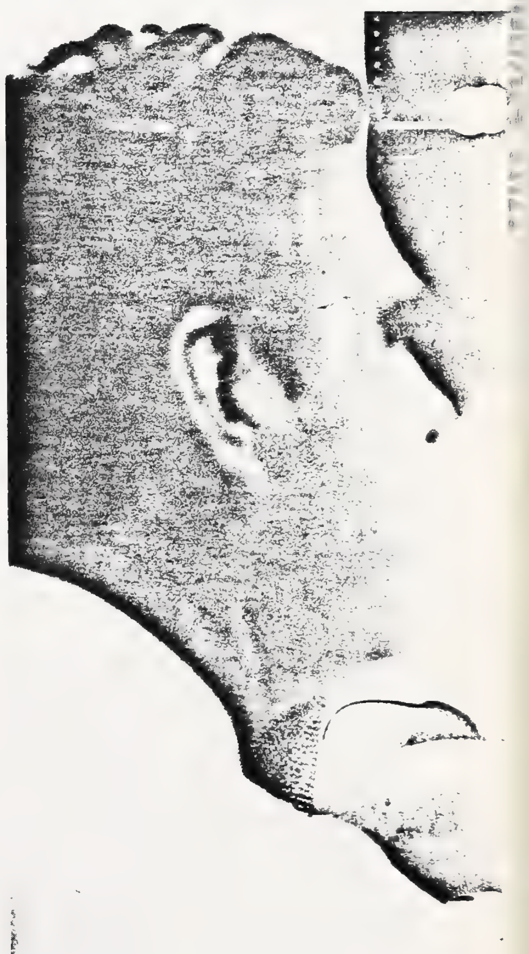
Despite all the obstacles, real and imagined, in the two and a half years that Dr. Marston headed the program, it mushroomed in size and scope and gained nationwide acceptance.

This success in his first job in government medicine led the *New York Times* to describe Dr. Marston as a "diplomatic doctor" and his role in bringing the Regional Medical Programs to the big cities and backwoods of America a "triumph of diplomacy." The "diplomat" label stuck. It was later picked up by the *Wall Street Journal*, then repeated in another story in the *Times*.

Is Dr. Marston, by his own definition, a diplomat? Was it diplomacy, or just plain hard work and talent that catapulted him from his initial post to director of the newly created Health Services and Mental Health Administration last April, then to the job he took over Sept. 1—director of the National Institutes of Health?

Dr. Marston, a man who dislikes labels, asks with a smile: "A diplomat? That's really something for other people to decide, isn't it?" The smile fades and he adds: "No, my goal wasn't to be diplomatic, but to get the program going. It's true, I'm inclined to bring people around to my way of thinking, but not through diplomacy; through facts."

He concedes that politics can sometimes get in the way of progress and that a little diplomatic maneuvering can ease the way. But this calls for the diplomatic use of facts, not backing down on objectives. "One thing you have to keep in mind," he says, "is that science is not opinion. The scientist is completely lost



unless he constantly goes back to the evidence. And Congress, too, is a respecter of facts."

Dr. Marston believes it was the overwhelming preponderance of facts which led to the acceptance of the Regional Medical Programs. "They were designed," he explains, "to implement a law that had been passed after a lot of controversy, but against a background of some fairly long-term trends that led to the undeniable conclusion: it was the logical thing to do."

The new NIH director is confident, too, that logic will in the long run rule decisions on all-important appropriations for support of the massive research, educational, and health programs that spread the ageny's activities and influence far beyond the tree-shaded, 301-acre "campus" at Bethesda.

It has been said that, as chief of the NIH, Dr. Marston will often have to bow to political expediency. "Perhaps," he says, "but not in a way that gives me great concern. Again, it gets back to the facts. The first thing you have to do is to get an assessment of the state of the art. If the facts are clear-cut, there are no problems with political expediency. All the political expediency in the world won't prevail then."

He cites a hypothetical case. "Take, for example, our studies in the chemotherapy of cancer. Say we have made some significant progress. This will create a strong desire by Congress to see further results. With scientific evidence to back us up, we'd have all the cards stacked on our side."

But what if there are other decisions to be made, such as: Should Congress put more money into Vietnam or the cities? In medical or space research? In foreign aid or domestic programs? The answers to these questions will have to be decided by Congress, and that is where Dr. Marston believes they should be.

Under the thirteen-year administration of Dr. James A. Shannon, who retired Aug. 31, the NIH budget grew at an annual rate of as much as 30%, from $98 million when he assumed the post to about $1.5 billion by mid-1968. Dr. Marston is a realist who knows finances will not be so rosy in the years ahead. Impending economies already have affected NIH in two major ways. They have led to personnel cutbacks, making it difficult for the agency to undertake new programs, such as the National Eye Institute, authorized by the 90th Congress, and to maintain the level of other already established operations.

"The economy measures," Dr. Marston points out, "create particular problems in areas of rapid turnover of personnel, especially in those having to do with direct patient care. It's not only the money problems, but also the personnel freeze, which limits us to

70 new people for every 100 who leave. The freeze will have a cumulative effect because it comes on top of a problem which has grown increasingly acute at NIH, that of recruiting and holding top-notch people. Income differentials just don't put us in a good competitive position."

While he cannot predict how long the personnel freeze will continue, Dr. Marston fears that if it goes on for "many months we'll have to seriously consider curtailing some programs and reducing resources previously available to grantees. But unlike some others, NIH programs are largely interrelated and dependent on continuity."

While keeping one eye on the pocketbook present, Dr. Marston keeps the other on the uncertain future. He is concerned about how one will affect the other. All estimates he has seen indicate there will be an increasing investment in health in the years ahead, from $50 billion to $100 billion a year in the 1970s. What will the NIH investment be? Dr. Marston does not see how specific areas for which funds will be spent can be pinpointed. He points out it is not an "either-or" situation.

"You just can't sit down at a table and decide you'd like to have more doctors educated, or you'd like to spend more money on research, or maybe stop everything and just do what you know how to do," he says.

He believes it is difficult to separate one need from another. But he is certain of one thing: the nation must continue to invest heavily in biomedical research, the one thing on which he believes all aspects of health care ultimately depend. Dr. Marston holds to this conviction in the face of past criticism that the NIH spends too much money studying man and not enough trying to find cures for the diseases that plague him.

"Criticism like this," he says, "develops from a basic misunderstanding of the nature of biomedical studies as they compare with other types of research. The study of man is almost certain to produce information which will be helpful to man."

Scientists go into biomedical research not only because they want to know more about man, but also because they want to do something that will be beneficial to him in the future, Dr. Marston points out, adding: "I'm not saying men in other fields don't have the same drive, but I think this is particularly true of those in biomedical research. Here, especially, scientists tend to be alert to the applications of their findings to disease and health."

Recalling hundreds of visits he has made to NIH-supported facilities across the country, Dr. Marston points out that everywhere he went he found men and women excited about what they were doing because they knew that someday their work might help cure people. He places special emphasis on the interplay of people working on projects that someday could mesh to produce the very cures the critics say they are not seeking.

"For example, a person picks a project to synthesize insulin because there's a disease called diabetes," he explains. "The fact that one scientist works on the structure of insulin may someday be important because another scientist has discovered that different types of insulin have varying effects on people with this disease.

"An approach of this kind is more effective than having one group work on basic problems while another tries to find a cure for a disease. That's not the way it works," he maintains.

One of the basic strengths of the NIH, Dr. Marston says, is the fact that the institutes work together. "There was a meeting recently of an international group of physiologists, and my guess was that there were representatives of every institute present," he points out. "This indicates what I've implied all along —that NIH scientists don't and shouldn't feel constrained to restrict themselves to curiosity about a particular disease."

Dr. Marston's love affair with biomedics probably stems from the two years he spent at Oxford University as a Rhodes scholar following his graduation from the Medical College of Virginia in 1947. He worked under the late Lord Howard Florey during the years just before the British scientist was awarded the Nobel prize for his work with penicillin.

The posts Dr. Marston has held since returning from England and a year of internship at Johns Hopkins and another of residency at Vanderbilt University have all served to justify his original reason for going into medicine: "That's where the problems are."

Dr. Marston got his first taste of government medicine from 1951 through 1953 when, as a member of the Armed Forces

Continued on page 21

Special Weapons Project, he was stationed at the NIH where he conducted research on the role of infection following whole body irradiation.

After his discharge, Dr. Marston took another year's residency at the Medical College of Virginia, which was followed by teaching posts as a Markle Fellow on that campus and at the University of Minnesota. He returned to Virginia in 1959 to become associate professor of medicine and assistant dean. In 1961 he was named director of the University of Mississippi Medical Center and dean of the School of Medicine. Dr. Marston became vice-chancellor in 1965.

Looking back, Dr. Marston admits it has been a long time, if ever, that he had a job that did not have built-in problems. But in the health field, he adds, it is not just a matter of solving problems, it is "searching for the right ones to solve."

"You know," he says with a slight chuckle, "I've never been associated with a group that put in longer hours or did more work. But don't get me wrong. This is a good job. And do you know why? Because you don't spend much of your time on little problems—only on significant ones where the stakes are high. That's what I like."

While admittedly too busy for hobbies, Dr. Marston says he and his wife try to follow the hobbies of their three children. There was a five-week camping trip in the Rockies and a family sailing venture last summer off the Virgin Islands. And he does find time now and then for horseback riding. ▣

TAB 16

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Statement by Director, National Institutes of Health

on

1970 Appropriation Estimates

Mr. Chairman and Members of the Committee:

I am pleased to have the opportunity to appear before you this year in a new role. Although my association with NIH is not new --I first worked there in 1951 and, more recently, served for nearly three years as an Associate Director of NIH and as Director of the Regional Medical Programs while that was part of NIH--I have been the Director of NIH for only six months which is a very short time for a post that during the past 81 years has had only 8 incumbents. However, the newness of my role here today is not due primarily to my own recent appointment but to the fact that I am here to testify about the goals, plans and needs of what is, in fact, a new organization, operating in a new departmental framework, under a new administration.

As a result of the reorganization of the health functions of the Department that was announced last April, NIH is now not only the mainstay of biomedical research in this country but also has responsibility for Federal support of education in the health professions and for biomedical communications. The new NIH consists of three major components:

... the research Institutes and Divisions--to which we still sometimes refer, collectively, as 'the old NIH';

... the former Bureau of Health Manpower which has been somewhat reorganized and given a new name--it is now the Bureau of Health Professions Education and Manpower Training; and

... the National Library of Medicine.

I should at this point, Mr. Chairman, like to introduce the top staff of the new NIH who are here with me today.

Dr. John Sherman is the Deputy Director of NIH.

Dr. Robert Berliner is the Deputy Director for Science and is also acting as Associate Director for Direct Research.

Dr. Leonard Fenninger is the Director of the Bureau of Health Professions Education and Manpower Training.

Dr. Martin Cummings is the Director of the National Library of Medicine.

Dr. Ronald Lamont-Havers is the Associate Director for Extramural Research and Training.

Mr. Richard Seggel is Associate Director for Administration.

Dr. Thomas Kennedy is Associate Director for Program Planning and Evaluation.

The three major components of NIH have distinct but complementary functions. The Surgeon General, in his testimony, has already described the considerations that led the Department to bring these activities together. Let me just repeat the principal reason

which was succinctly stated in the Department's press release announcing NIH's broadened authority and new role. It said:

> "Modern biological science and health professions education are so intimately inter-related that their effective and efficient management within this Department requires that they be the responsibility of a single operational unit. This will now be the NIH."

This intimate relationship is partly due to the fact that biomedical research and health professions education are largely carried out in the same institutions. For the most part, they require the same kind of facilities and depend on people with the same professional qualifications.

While the interplay of research and graduate education is helpful to both, it is not equally helpful to both. It is possible to perform first class research in an institution which has little or no responsibility for formal education. In fact, NIH's own intramural research activity at Bethesda is an outstanding example of such an institution. However, it is not possible to provide a first class professional education for scientists in an institution in which little or no research is conducted. Especially at the more advanced levels of professional education, the methods, techniques, and the intellectual discipline of research are an essential part of the educational process. Progress in most scientific disciplines is now so rapid that a new scientist--and I include physicians in that term--must have a keen awareness of the directions of research in his field. His

exposure to the potentials and limitations of research must begin as an integral part of his professional education. In fact, as a well-known physician has pointed out, "the faculties developed by doing research are those most needed in diagnosis".

Our efforts to harmonize effectively the support for biomedical research and education must be undertaken under the cross-fire to two fairly common criticisms on which I should like to comment. One of these criticisms is that the support now available for research has unbalanced the academic community and detracted from the performance of its educational function. The truth is that the academic community is out of balance in the same way that a man who has thrown one foot forward is out of balance. If his objective is to take a step forward, he must obviously restore his balance by bringing the other foot forward too. It is true that we have thrown the research foot well forward. The imbalance in the academic community is not due to too much research support but to the unfortunate fact that, until recently, this has been the sole kind of Federal support available. There is a clear and urgent need for comparable educational support. As you know, the Health Professions Education Act of 1963--and its amendments and supplementary legislation--are designed to provide this sort of support. It is part of the new role of NIH to restore balance by bringing the educational-support programs into line with research-support.

The other criticism often heard today is that research is enticing physicians from the practice of medicine. Let me counter that with some facts.

In the first place, most of the laboratory research in biomedicine is performed not by MDs but by PhDs who are not licensed to provide health care. At NIH, for example, nearly half of the professional staff with doctoral degrees hold some degree other than an MD. Nearly 70 percent of our research grants are for projects on which the principal investigator is not an MD.

Actually, the number of physicians who are mainly engaged in research is surprisingly small. The American Medical Association has just published a statistical summary of the major professional activities of medical school graduates who were living on December 31, 1967. This study shows that of the 296,400 graduates who were still active, 93 percent were engaged in patient care. The other 7 percent was mainly accounted for by 11,400 physicians who were members of medical school faculties and 4,240 who were engaged in administration. The glaring fact is that only 4,726 physicians--or 1.6 percent of the total--had research as their major professional activity. While it is, of course, true that some physicians, especially those on medical school facilties, combine research with their other activities, it is noteworthy that of all the physicians who are not primarily engaged in patient care less than a quarter list research as their major activity.

Physicians engaged in research are, with very few exceptions, engaged in clinical research which must involve a physician. As clinical research is, by its very nature, a combination of research and patient care, the research-physician has not withdrawn from practice. He is probably providing more intensive and higher quality care for his patients than they would receive if he were not engaged in research.

Finally, it is usually true that a physician of the caliber required for successful competition for research-grant funds could make more money if he devoted himself solely to practice in his specialty. He has certainly not been enticed into research because there is money in it. On the contrary, he is in research because he has intellectual curiosity--and, probably, unique talents for research --and because he hopes to make a fresh contribution to the solution of disease problems. A research grant enables him to do this effectively by making the necessary resources available but it provides neither the initiative nor the motivation.

The growing awareness of the problems in health professions education and, especially, of the deficiencies in the provision of health-care services in this country has understandably diverted attention from the importance and needs of biomedical research. In fact, in some quarters the pendulum has swung so far that research is viewed as an expensive hobby that must give way to more urgent needs. This strikes me, Mr. Chairman, as a little like saying that the goose that lays the golden eggs should no longer be fed.

The ultimate purpose of all health activities must be the prevention or cure of disease--and, when neither of these goals is yet attainable, the amelioration of the effect of disease both in terms of extending the useful life of the patient and of minimizing disability and suffering. This is indeed the purpose of all of the programs supported by the NIH appropriations.

Effective action against disease requires, first of all, a knowledge of what is wrong and the availability of some means for doing

something about it. In general, the better our understanding of the cause and usual course of disease, the more likely it becomes that we will be able to develop some means of coping with it. That, in essence, is the purpose of biomedical research: the constant expansion of knowledge and its translation into applicable preventive or therapeutic methods.

During the past decade NIH has contributed to the expansion and strengthening of every major health institution in the country. Almost every major medical advance in this country has to some extent depended on research supported by NIH. Almost every citizen has benefited --and will continue to benefit--directly or indirectly from these research programs.

In fact, research during the past decade or two has completely changed the practice of medicine. Most of the drugs now in common use for the treatment of major diseases were unknown or unrecognized as therapeutic agents when I started medical school in 1943. A whole series of new surgical techniques have been developed that make it possible to intervene in situations in which surgeons used to be unable to help. New and better techniques for monitoring patients and for automating laboratory tests have been developed. Mechanical assistance devices then unknown--such as the pacemaker and the so-called artificial kidney, which is actually an external blood-cleansing device--have already saved thousands of lives. You are well aware of recent dramatic advances in the technology for transplanting human organs. . All these radical changes in the practice of medicine--and the certain expectation of even more revolutionary advances--are the direct result

of the expansion of research facilities, the enlargement of the corps of research scientists, and the provision of funds to support their work. The greater effectiveness of modern medicine is the tangible pay-off for the investment that has been made in medical research.

This Committee has just heard testimony in support of a request for funds to launch a large-scale vaccination program against German measles in order to head-off the next epidemic. The last epidemic resulted in the birth of some 30,000 children with serious congenital defects. The effort to forestall a repetition of such a tragedy was made possible by a concerted research effort since the last epidemic. Not only did NIH provide a major share of the support for this research but NIH scientists, working in the laboratories at Bethesda, made major contributions to the development of the vaccine.

I shall leave to the witnesses who will testify for the appropriations of the various research Institutes the pleasant task of reporting to you on significant progress in research against some of the major diseases. At this point, it is, I think, more important for me to emphasize the serious and bewildering gaps that exist not only in our knowledge of diseases but in our understanding of the intricacies of normal biological processes.

Despite the impressive--and often dramatic--progress that has been made in the prevention, diagnosis and treatment of many diseases, the art of medicine is still a rather primitive science. In fact, a frequent consequence of new advances in knowledge is to raise even more difficult questions or to expose new areas of ignorance. This state of the art lies behind our constant insistence on the importance

of what, for want of a better name, is usually called 'basic' research. Basic research is not the opposite of applied research, as so many people seem to think. Basic research is the essential first stage of exploration in a new area. It is basic research that makes so-called applied research possible. With rare exceptions, the practical advances of today are the fruit of basic research done over a considerable period of time by a number of different investigators. I am absolutely certain that any slow-down in basic research will be directly reflected in the postponement of solutions to many disease problems. It is particularly important, in an era of restricted budgets, not to lose sight of the indispensable role played by basic research in achieving the objectives of the NIH programs.

I have talked about research at some length but I can sum up my view very briefly. Research is the root on which all other health activities grow. Without that root, no further growth is possible --either in improving the quality of education or the quality of medical service. The old adage that 'knowledge is power' is nowhere more applicable than in the practice of medicine and, as Sir Howard Florey, the developer of penicillin, has said "the lesson of twentieth century medical science is ... that experiment is the most efficient method of acquiring new knowledge".

However, knowledge is useless unless it is properly applied. The second requirement for effective action, therefore, is highly trained professional personnel.

I have already touched on the urgent need for a more vigorous attack on the manpower shortage in the health professions. Since the

beginning of this century the production of physicians has barely kept pace with our growing population. The number of physicians, in proportion to population, is no better now than it was in 1900. At the same time, the need for highly trained physicians and other health personnel has grown sharply as the result of two factors. The first is the greater sophistication of medical practice and the consequent growth of specialization. As a direct result of research, the medical profession is able to deliver care that is infinitely superior to what was possible in 1900 but it takes more--and more diversified--manpower to do it. The second factor is the rise in public aspiration for health care and the consequent rapidly growing demand for high quality professional services. To this we must add, as a third factor for the future, the demand arising from programs designed to bring better health services to the aged and the disadvantaged and to make the best medical care that is technologically possible readily accessible in all parts of the country. The need is thus for a greater number of better trained people in all of the health professions.

We are now in the stage of having to raise our national commitment to medical education to a higher plateau during the 1970's as we raised biomedical research during the late 1950's and early 1960's. The primary burden of doing this will necessarily fall on the Federal government--especially for training at the doctoral level. Medical and dental schools are, in a practical sense, national rather than local or even regional institutions. The AMA study to which I have already referred shows that more than 57 percent of the graduates of U.S. medical schools practice in a state other than the one in which they were educated.

Questions have been raised about the share of responsibility that the Federal government must assume for the training of nurses and the allied health professions. It is, of course, true that facilities for training nurses and health technologists are more geographically dispersed than medical or dental schools and that their graduates normally find local employment. It has, therefore, been argued that nurses and technicians constitute a state or regional--rather than a national--core of service personnel and that their training might well be regarded as primarily a state or regional responsibility. However, shortages in these professions are no less acute than the physician shortage and the existence of an adequate number of well-trained nurses and other supporting personnel is no less a national need. Moreover, new national programs such as Medicare, Comprehensive Health Planning, the Regional Medical Programs and the Model Cities program are major factors in greatly increasing the demand for auxilliary health personnel. It is therefore both necessary and appropriate for the Federal government to stimulate and assist the development of suitable training programs for allied health personnel. This is, indeed, the purpose of the institutional and special project grants and the traineeship, scholarship and loan programs authorized by the Nurse Training Act of 1964 and the Allied Health Professions Personnel Training Act of 1966 and subsequent legislation.

A particularly urgent problem, to which the Secretary has already referred in his testimony to this Committee, is that a number of our medical and dental schools are having serious financial difficulties. The viability of these schools is a matter for serious concern at a time

when we are not only faced with a critical manpower shortage--and are, in fact, in process of establishing additional medical schools--but when urgent social needs are making increasing demands on them.

A more adequate and stable form of institutional support, than now exists, must be provided if the medical, dental and other professional schools are to rise to the challenge that national societal and manpower needs have placed before them. Such support should not simply be designed to relieve current financial stresses but should have the more important aim of restoring confidence in the Federal government's long-term policies in regard to the support of biomedical research and education. This confidence has, unfortunately, been shaken by NIH's inability, for budgetary reasons, to carry out the intentions of the 1966 extension of the Health Research Facilities Construction Act and by the necessity, in order to effect the required reductions in 1969 expenditures, to dilute its long-standing 'moral commitment' policy by renegotiating grant awards that had already been approved.

The close and mutually dependable relationships that have been carefully built up between the principal centers of biomedical research and training and the categorical Institutes are a valuable, if intangible, asset. They have been a major factor in the rise of this country's biomedical research effort to its present preeminence. They are no less important to the smooth evolution of the important health manpower programs that are now in their initial stages. I am convinced, Mr. Chairman, that the success of the Federal government's partnership with non-Federal institutions in such national programs depends largely on two conditions

... the predictability and reliability of Federal assistance; and

... the feeling of common purpose and professional rapport that exists between the institution and the Federal agency with whose programs it is involved.

I believe that these conditions are, in the long run, more important than the actual funding level.

The immediate purpose of institutional support for medical and dental schools under the health manpower appropriation is to make possible--and provide an incentive for--substantial increases in enrollment. As you know, most of the schools, for quite understandable and legitimate institutional reasons, have in the past resisted moving in this direction. There has, however, been a profound change in attitude and there is no longer any reason to doubt that this program will succeed to the extent that resources for it become available during the next few years.

A longer-range purpose of these institutional grants is to facilitate the development of more efficient and effective educational processes in institutions which have diverse aims and capabilities. New approaches in medical education are desirable for three reasons. First, simply in order to accommodate a larger number of students without a proportional enlargement of facilities, faculties, and funds. Secondly, in order to maintain quality standards during a period of fairly rapid expansion --and, if possible, to raise them. As someone has said, it would be wonderful if we could double the number of schools in the top 25. And, thirdly, in order to prepare students to experiment with changes in the delivery of health services such as the greater use of auxilliary personnel for some of the activities that now absorb too high a

proportion of the average practitioner's time but that do not require his extensive---and expensive--training.

The third prerequisite for effective action against disease problems is the constant flow and the ready accessibility of the products of research to the people who are in a position to use and apply them. This is largely a question of communication which, as yet, presents many problems. One of the principal functions of the National Library of Medicine is to provide imaginative leadership in the development of new techniques for the storage, retrieval and dissemination of biomedical information.

Communication of research information is the gateway to its application and it is the most reliable device for constantly enhancing the quality of service to the patient. Communication provides the essential links between research, education and service. It is no less important to the maintenance of a high standard of training. It provides the cross-fertilization that greatly increases the yield of research.

The National Library of Medicine, which is now part of NIH, plays a major national role in biomedical communication. Last year the Congress passed a bill authorizing the establishment and construction of the Lister Hill National Center for Biomedical Communications as part of the National Library of Medicine. A request for $900,000 in planning funds for the construction of the Lister Hill Center is included in the budget estimate. The purpose of the Center will be to provide--in the language of the bill--"an urgently required facility for the improvement of communications necessary for health education, research and practice". It is hoped that the Center will be able to provide leadership for the

rapid development and standardization, on a nation-wide basis, of the technological aspects of biomedical communication, information systems, and network projects.

This Committee will be pleased to hear that we are making good progress in creating the John E. Fogarty Center for Advanced Studies in the Health Sciences. A contract for the design of the building was signed last December. The plans are due to be completed by April of next year and we hope that a request for construction funds will be included in the 1971 budget estimates. Meanwhile, the restoration of Stone House is underway and will be completed by July of this year. Stone House, which was the residence of the former owners of part of the NIH campus, is a substantial and attractive building on the site chosen for the Fogarty Center. It will become a permanent part of the Fogarty Center facilities. Dr. Leavitt, the Director of the Center will report to you later in these hearings on the programs of this memorial to the late Congressman Fogarty.

I have touched briefly on the major responsibilities of the new NIH. All of the wrinkles have not yet been ironed out of the new organization and a number of administrative problems remain to be solved. In developing the new organization we shall strive for the best balance among the various activities always bearing in mind that their ultimate purpose is to achieve the most effective approach to the prevention and cure of disease.

Last year when Dr. Shannon made his last appearance before this Committee as Director of NIH, he described the budget estimates as "Spartan in character" and as "necessarily limited ... to the amounts

that can be justified as essential if the medical research establishment of the nation is to be maintained at an effective level and not be threatened with disarray and deterioration". The budget request now before you is no less Spartan and no less limited to the absolute essentials.

The appropriations requested for NIH total $1,484,127,000 which is an increase of $90.1 million over the comparable appropriations for FY 1969. However, in terms of funds available for obligation--which takes into account carried-over funds that remain available for obligation in some of the NIH programs and restrictions on obligations during FY 1969--the net increase for NIH is only $31.7 million or slightly more than two percent. The funds requested are distributed as follows among the major activities of NIH:

... The $275.6 million requested for direct operations of the Institutes and Research Divisions includes $89.2 million for the conduct of research by the NIH scientific staff and $127.4 million for collaborative projects. The remaining $59 million is for other direct operations, program direction, administrative services and management of the extramural program.

... Of the $634 million requested for research grants, nearly $170 million is for the special research grant programs --including $53.6 million for General Research Support --and $331 million is for non-competing research projects which we already have a commitment to support. This leaves $133 million for competing grant applications--an increase

of $6.3 million over the amount available for FY 1969 mainly for the new Eye Institute and for family planning research.

... The requests for training grants and fellowships total $190 million--a decrease of $7.7 million from the amount available for FY 1969.

... $245.5 million is requested for the health manpower programs --an increase of $38.8 million over the comparable figure for FY 1969. A little over half of this amount ($123.9 million) and $30.4 million of the increase is for the institutional support programs.

... $11.9 million is requested for dental health activities which is an increase of $1.7 million.

... For the construction programs, which are now combined in the Bureau of Health Professions Education and Manpower Training, the budget request is $126.1 million. Together with carry-over funds, this will make $149 million available for obligation which is nearly $25 million less than the comparable figure for FY 1969. An increase of $10.8 million is allowed in the construction funds requested for medical schools but this is more than off-set by a $10.8 million reduction in construction funds for schools of nursing and by the absence of any request for funds for the construction of health research facilities, medical libraries or allied health professions schools.

... $22.2 million is requested for the National Library of Medicine which, with carry-over funds, will result in an increase of $2.7 million in the amount available for obligation. The increase is mainly for operating the library and for the activities of the Lister Hill Center. The amount included for grants ($7.6 million) is slightly less than the comparable amount for FY 1969. In addition, $900,000 is included in the budget item for Buildings and Facilities for architectural planning of the Lister Hill National Center for Biomedical Communications.

These figures admittedly do not make full allowance for everything that could, or should, be done. Health activities--important though they are--must, like other important social programs, continue to be limited by over-riding economic constraints. The funds requested do, however, provide for the maintenance of commitments in almost all program areas and allow for modest expansion in some particularly urgent ones. The 1970 budget request is, like the 1969 budget, as lean as is possible without seriously curtailing the activities which it is designed to support. I hope, Mr. Chairman, that circumstances next year will permit resumption of a more vigorous pace for these significant health programs.

TAB 17

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NIH AND THE NATION'S HEALTH NEEDS*

Robert Q. Marston, M.D.**

I appreciate this opportunity to discuss with you a subject that directly concerns us all: the Nation's health needs and how we mobilize our resources to meet them.

The pressures to meet these health needs are coming from many sources, both within and outside the health professions, both within and outside the various arms of government--state and local as well as Federal. No one can doubt that these pressures are generating a strong desire for changes--in medical education and biomedical research, in the organization and delivery of health services, and in the prevention of disease and the control of the environment.

Ours is a nation in the process of accommodation to swift and searching tides of change in all areas of human concern. The expressions of this accommodation are clearly and harshly audible across the whole range of our society. We hear them particularly in the waves of protest and counter-protest in cities and towns and college campuses, and in the deep moral concerns and dilemmas of the Vietnam war. If we listen carefully we can also hear expressions of this accommodation, less noisy but perhaps more significant for the future, in the changing of gears and changing of minds as society begins to respond to these new pressures. Our society

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*Presented at the Annual Meeting of Kentucky Health Association, Louisville, Kentucky, March 31, 1969.

**Director, National Institutes of Health, U.S. Department of Health, Education, and Welfare.

is undertaking a serious re-examination of itself and of the way it governs itself and of the way it makes decisions. Against this background and at this time, it would have been most appropriate for the new Secretary of Health, Education, and Welfare, Mr. Robert H. Finch, to have keynoted this annual meeting of the Kentucky Public Health Association. He has asked me to express his regrets at not being able to be with you, and his best wishes for an outstanding meeting.

Over the years and over the centuries, we in the health field have enjoyed relative immunity from the political and social currents swirling around us. Health and medicine in a sense have been considered above the battle--important to society but somewhat removed from its turbulence. Statesmen have spoken kindly and rather vaguely about health, and our own medical statesmen, with a few notable exceptions, have tended to speak with equal kindness and vagueness about society as a whole.

Now, however, it is very plain that this immunity, this divorcement, is a thing of the past. Whether we like it or not, we are involved to the hilt in the social dynamics of our time, and we are sharing fully in the pressures driving toward accommodation.

Health and medical care are hot topics--not the cool subjects for reflection that we have known them to be. They are political topics. They are stage front, under the bright lights of national attention. This is a strange and unaccustomed and in some ways unfortunate place for physicians and other health professionals, but that is where we are.

The forces that combined to put us there are essentially twofold. The first is the force of the scientific revolution in medicine. Thanks to an unprecedented national commitment to biomedical science, our

medical capability has spectacularly increased in the last few years and will continue to do so at an accelerating rate far into the future. The second is the force of the social revolution with respect to health as an attainable condition of man.

Until very recently, superior health care for all was viewed as an unrealistic goal. Other nations, particularly the socialized ones, have talked about equal care for all, and we ourselves have thought in terms of a minimal level of care for all. Today, there is a national commitment, with very broad support, that views the best of good health and excellence in health care as a right to which all can aspire.

Unquestionably, to face squarely the problems of meeting the Nation's health needs will mean a degree of discomfort. We in the health field will be especially uncomfortable--first of all, because any change might suggest real or imagined deficiencies in the past and, secondly, because whatever we may do in the health field will undoubtedly fall somewhat short of our high goals. Furthermore, our experience in universal delivery of excellence is limited, and our present knowledge and resources are probably inadequate to the task.

This week I've made it a point to be in a hospital, to visit a research lab, to talk with state health officers and with a practicing physician about a specific patient problem, and at the same time to discuss national health problems in research and education with a Congressional appropriation committee. I can assure you that the people who are interested in health, who seek a career in this field, or who are instrumental in supporting our efforts are dedicated, are concerned about inadequacies, and do have as their primary goal helping people.

Despite this high motivation, there is some outright pessimism about our ability to meet the Nation's needs in health, as well as in other fields--more, perhaps, than at the depth of the depression or in the midst of either of the major world wars. In part it may be that our social conscience is more rigorous today than it was in those times. We are trying to move beyond the basic necessities for food and shelter and minimal health care into the area of health care as a foundation for self-fulfillment. And this movement raises new problems for us.

How shall we approach these problems? I have no blueprint, nor do I believe that such a blueprint exists. For any blueprint imposed upon this large and complex nation would inevitably fail to meet the differing needs of different parts of the country and would not utilize the unique strengths of each region or locality. Put another way, I do not believe a federal or socialized system of medicine could be constructed, much less implemented, to meet the health needs of this nation. Rather, we are challenged to develop processes that take full advantage of our pluralistic health resources, and we are already seeing evidence of serious attempts in many directions to meet this very serious challenge.

Although I shall direct my discussion primarily to Federal activities, it is important to recognize that others could speak equally well about the changes occurring in the voluntary and professional health agencies, in the hospital field, in the business world and at the community, regional and state levels. Indeed, with so much going on in so many places, the reasonable question may well be asked: What is the Federal role in the health field, and what is it likely to be in the future? In some areas, there are clear answers; in others, only very important questions.

In the support of biomedical research, the Federal Government has had and will undoubtedly continue to have the dominant role. In medical education the Federal role is of recent origin, but because of the serious financial plight of educational institutions in the health field, Federal support in this area will undoubtedly grow in the future. Still more recently, it has been decided, after years of discussion, that there is a Federal role related to the purchase of health services for the aged and, jointly with the states, for the indigent. In each of these instances the nature of the Federal role is clear--support of individual and institutional initiative in science and education, and a guarantee of payment for services rendered to selected groups in need.

In relation to the organization and delivery of care, however, we are definitely in the experimental phase. This experimental movement is represented by the Regional Medical Programs for Heart Disease, Cancer and Stroke (P.L. 89-239); by the Comprehensive Health Planning Act--the "Partnership for Health," as it is also called (P.L. 89-749); and by the National Center for Health Services Research and Development established in the past year. These programs are closely related. Yet the reasons for their emergence were quite different.

For instance, the National Center for Health Services Research and Development arose because of the clearly perceived need to bring together within the Department of Health, Education, and Welfare the various activities involved with research and development in the health-service field and to expand these efforts in a systematic search for new knowledge. It is a development comparable in some ways to the establishment of the National

Institutes of Health, some years ago, for the parallel purpose of stimulating and supporting research in biomedical science.

The Partnership for Health program emerged in response to two serious needs. One of these was the necessity for support of comprehensive health planning at the state and local levels, including activities usually considered outside the health field but closely related to health programs. The second was the need for increased flexibility in the joint funding of state activities so that resources could be effectively targeted on priority needs. This latter purpose has been accomplished by decategorizing both the formula and the special-project portions of such support.

The Regional Medical Programs for Heart Disease, Cancer and Stroke grew from a concern with the relation of scientific advance to the actual delivery of health services. It stemmed from a sense of need to stimulate regionalization so that the best of health care could be made available through the sharing of scarce resources and the extension of the capability of major centers to the community at large.

Each of these major new endeavors--the Regional Medical Program, the Partnership for Health, and the National Center for Health Services Research and Development--is heavily dependent on the use of nongovernmental consultants, both for policy determination and for the actual distribution of dollars. Their work is interrelated with agencies outside the Federal Government at every level. They represent major new mechanisms by which the Government can work to carry out its responsibilities to help meet the Nation's health needs.

Since I was associated for two years with the Regional Medical Programs, let me cite a few examples that illustrate how that effort, in the words

of the law, "encourages and assists activities designed at the local level to improve health care in the regions." It has without doubt encouraged a dialogue and the development of co-operative arrangements among existing institutions and organizations.

As examples of the kinds of co-operative relations that I saw beginning to emerge, four hospitals in Lafayette, Louisiana, working with the State Heart Association and one of the medical schools, decided to develop a high-quality coronary-care unit. This was to be jointly funded and equipped in one of the hospitals, with staff jointly recruited and trained, as an efficient means of improving the care of patients with myocardial infarction in that area. I saw in Anchorage, Alaska, in response to a need identified by the Washington-Alaska Regional Medical Programs, a community that is raising funds for a treatment center to house a high-energy radiation source. The center is to be operated as a regional resource by the Providence Hospital of Anchorage. In Nashville, Tennessee, the Vanderbilt and Meharry medical schools are collaborating with a neighborhood health center supported by the Office of Economic Opportunity to seek to provide comprehensive care to disadvantaged families for whom such care was never before available.

Efforts to bridge the gap between science and service are under way in many areas. In Missouri local physicians are testing the usefulness in patient care of computer-assisted and semiautomated interpretation of electrocardiograms. The project draws on the expertise and facilities of the University of Missouri and builds on previous work carried out by the Public Health Service's National Center for Chronic Disease Control, now

a part of the Regional Medical Programs. In Salt Lake City five hospitals are working together to explore computer application to clinical problems. In Wisconsin the Marshfield Clinic has established referral routes from five hospitals for emergency care of patients suspected of having pulmonary embolism.

Many other examples could be cited--joint projects in education and training, demonstrations of patient care, frankly experimental projects, and many more. The important thing is that new patterns of collaboration are evolving, and new combinations of resources are being applied to the delivery of service. The task of Regional Medical Programs is complex, and the effort is very young, but already it is demonstrating a vital and enthusiastic response, by the Nation's health resources, to an invitation for innovation.

Although the Partnership for Health legislation is newer still, one can already see the beginnings of similar progress in this program through the establishment of statewide health planning agencies, the strengthening of existing area-wide planning groups and the development of new ones, and the training of health planners. In addition, states and communities, taking advantage of the new flexibility in formula grants and project grants, are initiating high-priority activities aimed at meeting their special needs.

The National Center for Health Services Research and Development is too new to claim major results to date. It is clear, however, that two major and overriding problems will be faced by this as well as all Federal programs. The first is the problem of how to do better in making care accessible to the disadvantaged. The second is how best to protect all of us from the very rapid rise in health costs.

Accommodation to changing needs in the health field will require re-examination of our experience with older existing programs. To this end, Mr. Finch has asked all health agencies within HEW to undertake such a re-examination in depth. Since we at NIH have begun this task, I have become impressed with the potentials and the problems confronting us.

First, there is an urgent need to use all our resources wisely to meet the needs of people. Second, there is growing awareness that our investment in this area--conditioned as it is by demands for better health services and the search for better ways to finance such services--will inevitably enlarge our commitment of dollars to health. Consequently, I view our problem as: how to do better with more, not (as it seems in these days of dollar restraints) how to do more with less.

This should mean: more, not less, for biomedical research to provide the basic knowledge and understanding of the nature of man--knowledge on which all other efforts ultimately depend. We in biology have not yet acquired the basic science background that identifies the physical sciences. But we are making impressive progress--notably in such fields as enzyme chemistry, immunology, and molecular biology--and I am confidant that such research will continue to be the single most important influence upon the health of our people in the 1970's.

I should like to comment briefly on the reorganization last year of the Department of Health, Education and Welfare, inasmuch as it produced changes of major consequence for my own agency, the National Institutes of Health.

The reorganization of April 1, 1968, established NIH as one of the three major components now comprising the Department's health establishment.

The other two are the Consumer Protection and Environmental Health Service, and the Health Services and Mental Health Administration. The latter two represent regroupings of programs added in recent years, as well as traditional responsibilities long within the Department's purview.

For the National Institutes of Health, the reorganization has meant the assumption of new responsibilities for education in the health-related sciences and for the broad field of biomedical communication. This was accomplished by transferring to NIH the Bureau of Health Manpower, created a year earlier, and the National Library of Medicine.

So the broad mission of the National Institutes of Health now extends to four distinct fields: research, research training, education in the health professions, and biomedical communications. It is our belief that NIH is now better aligned with the organization of health professional schools through its common concern for health manpower, research and the preservation and communication of scientific knowledge.

NIH is well aware that progress in meeting the Nation's mounting health needs depends in large part on what we are able to do to meet the critical needs in the manpower field. There are shortages in most categories of health personnel, some of serious proportions. For example, we need right now approximately 52,000 more doctors, 9,000 more dentists, and 141,000 more nurses.

In some categories, with substantial efforts, we may be able to reduce the shortage somewhat within three or four years. However, in other categories, demands are increasing so rapidly that shortages are likely to become even more acute. Estimates of shortages indicate a need by 1973 for 42,000 more doctors, 21,000 more dentists, and 186,000

more nurses. As these figures indicate, there is today an urgent need to do much more in the whole area of health manpower.

The health programs of the Department of Health, Education, and Welfare represent a powerful array of forces. Pulling them together in an operational context will assemble around the same conference table, regularly and on a continuing basis, the leadership of programs whose activities are inseparably interlocked as they move in different ways to attain common goals.

However, this concentration of Federal forces, authorities and mechanisms can be truly effective only so far as it assists and stimulates and supports the far more powerful array of forces and talents throughout the Nation--the physicians and other health professionals, the providers of services, and ultimately the 200 million people of this country.

For the essence of the Federal role in health services is not direction but stimulation. The Government can be a definer of needs, an experimenter, a catalyst, an innovator. Acceptance of the right to health establishes beyond reasonable doubt the existence of governmental responsibility to participate in the process of fulfilling that right. The question among reasonable men is no longer whether there is a Federal role in health, but how to define that role and how to translate that definition into action so that the Federal resources are applied most effectively in partnership with other resources to meet the Nation's health needs.

This job--meeting the Nation's health needs--is the task before us. Its scope exceeds the ability of any one element to do it alone. My fear is not Federal medicine or socialized medicine, but the fear that we will not get the job done.

There are high hopes throughout the world that we in this country can demonstrate the same types of accomplishments in health care that we have demonstrated in other areas, such as medical research. Indeed, the hopes and the expectations of our own society are so high that we must face the possibility that the many challenges may exceed our combined ability to meet them all as we should like to. But there has never been a greater opportunity to work together for the achievement of truly important health goals.

Today we mourn a former President praised for many attributes and achievements. Over and over, special comment is made of his great ability to bring men of good will together to work effectively on great national and world endeavors. Herein lies your keynote, ladies and gentlemen, for the business of health in American and the world today is a great endeavor, greatly in need of your most earnest cooperation.

TAB 18

#599

MEDICINE FOR TOMORROW'S CHILDREN: ON WHAT FOUNDATIONS CAN WE BUILD?*

Robert Q. Marston, M.D.**

The observance of a centennial is a happy and exceptional occasion. It is a time to take stock of past accomplishments and to look to future opportunities. Measured beside much older institutions, such as the western European universities, a century might seem a rather modest milestone. But in this country, because of our youth, time has always had a different dimension. We have projected an image, both ridiculed and applauded, of a nation of people in a rush, leaping with almost unbelievable energy and optimism to accomplish tasks that many would have thought impossible.

That spirit of optimism, of belief in our capacity to master difficult problems, characterizes the actions taken a hundred years ago in this city to establish what is today the Children's Hospital Medical Center, the largest children's hospital in the United States and next to the oldest.

My very first contact with Children's Hospital was a unique and warm experience. Many years ago I stopped by Dr. John Enders' laboratory to make an appointment to get advice on additional training. There was a sense of excitement in the lab but also some problem about getting an appointment for any time in the next week. Finally, it was decided I should spend an hour with this remarkable man right then, as he ate his

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*Presented at centennial meeting of Children's Hospital Medical Center, Boston, Mass., April 19, 1969.

**Director, National Institutes of Health, U.S. Department of Health, Education and Welfare.

lunch. It was a memorable occasion for me--more memorable in retrospect when I learned that night that Enders, Weller, and Robbins had just won the Nobel Prize.

The modest 30-bed hospital for children which young Dr. Francis Henry Brown started in 1869, four years after this country ended a long, bloody and agonizing civil war, was located on Rutland Street in Boston's South End. Twelve years later the hospital, with a staff of 12, moved to larger quarters on Huntington Avenue. We are told that patient costs at that time were $1.22 a day.

The present century has been one of steady growth, culminating in a modern medical center which treats 12,000 inpatients a year and another 50,000 in outpatient specialty clinics. It contains the only school of nursing affiliated with a pediatric hospital.

Children's has exerted a pioneering influence in a number of fields. It was the first, for example, to set up an Adolescent's Unit to supply medical care to teen-age patients in facilities geared to meet their special needs. It operates the largest cystic fibrosis clinic in the world, one of the largest cerebral palsy clinics in the country, and the first PKU clinic in the United States.

The influence of this institution extends far beyond the city of Boston and the region it serves. Through its research and teaching programs, Children's is a national resource for the improvement of medical care and the training of manpower on a broad front.

No pediatric hospital, for example, has done more to advance the concept of total care for cancer patients than Children's. The success of this program, as well as the pioneering role of Dr. Sidney Farber and

his associates in the chemotherapy of childhood leukemia, are evident in the close relationship between the institution and the practicing physicians who look to it as a major resource for diagnostic assistance and referral.

The same can be said of Children's blood research center, which under Dr. Louis K. Diamond, has become a teaching resource for the entire Nation. One could extend the list almost indefinitely--Enders in the viral diseases, Gross in surgery, Shwachman in cystic fibrosis, and many others equally outstanding in their fields.

But beyond the advances that identify Children's as one of the Nation's great pediatric centers is something less tangible, something less susceptible to measurement. It is the example of an institution that has successfully served its community. The history of Children's is a record of devoted service by all the health professions and by the community at large. In an age when our cities are struggling desperately with problems that seem at times almost insurmountable, we need the example of success, the proof that problems are in fact soluble and that the democratic processes of persuasion and conciliation still work.

As we look forward to tomorrow, the prospect of further scientific advancement, supported by a perceptive and compassionate citizenry, encourages optimism. President Nixon summarized his view of a future enriched by science and technology in these words:

> Science has served mankind faithfully and well. It has dramatically extended the average lifetime, shortened geographical distances, increased industrial productivity, reduced poverty, and in the long trial of war, contributed significantly to the cause of freedom. . . .
>
> If science and technology were to founder or stagnate, many of our hopes would collapse. To the extent that we neglect this source of our greatness, and to the extent that we fail

> to preserve the conditions of openness and order that made our progress possible, we are living off the land of civilization without refertilizing it. . . .
>
> Instead, we must bring about a new dawn of scientific freedom and progress. As the world's investment in science expands, the impact of technological progress will be more profound. . . . In 20 years the world may be as enormously different from today as [today] is different from 1900.

The experience of Children's Hospital in the last century recapitulates to a considerable extent the history of the best of pediatrics. It is not necessary for me to specify further for this audience the numerous examples of the growing impact of science on practice; the constant ebb and flow of hope, expectation and frustration which are characteristic of the sick and those who care for the sick; and the impact of societal changes, of which there have been so many since 1869 as this Nation and the world passed through numerous major crises. We do have firm foundations in many areas on which we can build for the future, but there are also uncertainties.

Listen, for instance, to John Russell of the Markle Foundation as he talks, from the vantage point of 1968 and its urban riots, about the problems of an institution in keeping a focus on its objectives.

> As shot after shot rang out, as Washington burned, as work in universities came to a halt, to continue an "ordinary" program and to act as if nothing has happened might appear to be completely heartless and thoroughly stupid. And yet in spite of the daily headlines this Foundation did precisely that. We deliberately tried to "keep our cool," as we have many times in the past during national emotional crises.* * * * *
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> This foundation has weathered many such storms during its brief history. One came with World War II. Another came with the Korean war, and on that occasion we consulted many individuals, nearly all of whom urged the foundation maintain a "business-as-usual" policy as long as that was at all possible, on the ground that medical training and research must be maintained regardless of war. We

> have found this to be the present point of view even though the emotions stirred up at the moment are more intense. It's pleasing to know that so many approved our position even though we are all sick at heart. It's not easy to remain cool these hot nights.

This example of a small successful foundation in the health field, agonizing about the relationship of its past to its future, is indeed symptomatic of the main theme of your centennial exercise, focussing as it does on the next century in pediatrics. But there is a more important reason for my choosing this quotation as I turn from the consideration of your accomplishments to a consideration of the future.

Let me reread the last words: ". . .though we are all sick at heart. It's not easy to remain cool these hot nights."

How many in Boston in 1869 must have had similar feelings! How many must have sensed an almost overwhelming desire to bind up the Nation's wounds quickly at all costs! What little experience on which to choose the building blocks! for it was a new world and an uncertain world in which the age-old problems of man were close to the consciousness of everyone--ignorance, poverty, war, disease. But would anyone in Boston in 1969 suggest that our concern for these ancient enemies is less intense today?

As I look to the future, it seems to me that these constant companions of mankind will continue to ride our coattails for a long time to come. And we are moving into a new world--a world in which past experience, while pertinent and relevant in some areas, is unlikely to be pertinent or relevant in others. It is the exploration of this concept on which I would like to spend the rest of my time this evening.

Let me start by quoting Dr. Margaret Mead.

> The young people who are rebelling all around the world, rebelling against whatever form the governmental and educational systems take, are like the first generation born in a new country listening to their parents' tales of the old country and watching their parents grapple, often clumsily, often unsuccessfully, with the new conditions. They have no firsthand knowledge of the way their parents lived far across the seas, of how differently wood responded to tools, or land to the hoe. They see the tasks which their unaccustomed elders are performing as poorly done; they feel that there must be a better way, and that they must find it.
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> * * * * * * * *
>
> The elders are separated from the young by the fact that they too are a strangely isolated generation. No generation has ever known, experienced, and incorporated such rapid changes, watched the sources of power, the means of communication, the definition of humanity, the limits of their explorable universe, the certainties of a known and limited world, the fundamental imperatives of life and death--all change before their eyes. They know more about change than any generation has ever known and so stand, over, against, and vastly alienated from the young, who, by the very nature of their position, have had to reject their elders' past.

Even if true, you may say, what does this imply for medicine--essentially a science? Our future is dependent upon an orderly and painstaking accumulation and expansion of knowledge. We are not subject to the type of discontinuity that Dr. Mead describes, where a nation or a world changes direction so rapidly that almost all past experience becomes suspect.

But my answer is yes and no. While it is true in general that the forward march of biomedicine has been characterized to date by the accumulation of a large amount of information which, when synthesized, leads to relatively limited increases in understanding, it seems to me unlikely that this will continue to be so over the next century. We may hope for the development of general theories concerning life processes comparable to the quantum theory or other concepts from the physical science field.

How realistic is such a hope, and from what type of investment in human resources is it most likely to flow, and what will be the impact? The latter question is the easiest to answer. First, the need is eliminated for the detailed, step-by-step filling in of a gigantic, complex jigsaw puzzle, and the emphasis shifts to the design of experiments to test further and to amplify the general concept. Research will tend to become more abstract, more theoretical, and the application of the findings more predictable.

Perhaps of greatest importance would be the change in attitude of people in the health fields. And here it seems to me that we do have considerable experience, particularly from the impressive advances of even the last two decades. The advent of the antibiotics age did indeed change our way of thinking about illness, as well as raise new ethical and moral problems. The who-shall-live and who-shall-die question was a very real one during the early days of scarce supplies.

I started in medical school before the availability of penicillin and streptomycin, participated as a student in the first successful treatment of a patient in Richmond with generalized peritonitis, and then spent two years in the laboratory of Lord Florey (or Sir Howard, as we knew him then) just as the work on penicillin was being concluded there. As a result, I was keenly aware that the universe of infectious diseases in the early forties became almost irrelevant by the late forties. Medical practice, public expectation, and our attitude towards disease had changed overnight.

The second question--Where is one most likely to see the emergence of general theories of life processes?--can only be guessed at. Surely we are all impressed today with the advances in genetics--the understanding

of DNA and even the photographing of it--the recent reports of the synthesis of an enzyme, and the analysis of the antibody molecule. In Institute after Institute at NIH, one senses the excitement of our own scientists and those in the field at large.

Almost every line of research presents its broader implications. There are the various relationships in cancer as an approach to human biology, the use of L-Dopa in Parkinsonism as a key to better understanding of the nervous system, the effects of interferon on viral infections as related to the basic mechanism of RNA-cell reactions, the understanding of the reproductive process as related to the world's population problems, the concern with multiple low-level environmental contaminants on neonatal development--to name only a few.

In pediatrics, happily, the common childhood diseases are approaching extinction, and it is probably safe to predict that they will be virtually eradicated within ten years. So the field of pediatrics as we have known it, with its emphasis on the common infections, preventive inoculations, nutritional and digestive disorders, and congenital defects resulting from infection of the mother during pregnancy, will cease to exist, say, in the 1980's.

On the other hand, a broader view of pediatrics, encompassing child development throughout the perinatal period and beyond, reveals a field with remarkable capacity for growth. Here, there is a special need for the type of broad, sound, general concept of the basic nature of man which we must develop in the future.

Thus, with a little imagination, one can visualize a hospital for tomorrow's child. One major department will provide genetic counselling

for prospective parents. This service is already available, of course, with respect to certain known disorders in the family. As genetic knowledge and predictability advance, such a service will become more useful. It is feasible that eventually a precise "genetic profile" of the parents could be prepared (using tests yet to be devised) for computing the probabilities that offspring will inherit certain conditions, adverse or favorable.

Working closely with the genetic counselling department will be that branch of pediatrics concerned with the prevention of defects. Might we speak of "orthogestation"? An example in experimental practice today is the study of amniotic fluid withdrawn during pregnancy, particularly in regard to erythroblastosis fetalis.

The potentialities of this technique are indicated by a recent study on Lesch-Nyhan disease, first described by an NIH-supported investigator in 1964. This rare disease is characterized by brain damage, a compulsion to chew away the lips and fingers, excessive production of uric acid, and an early death. In 1967 Dr. J.E. Seegmiller, heading an NIH team at Bethesda, showed that Lesch-Nyhan patients are all males and are deficient in an enzyme of purine metabolism, PRTase,* as a result of a mutant gene on the X chromosome. The same scientists have now identified an unborn female child as a carrier of the trait, by measuring PRTase activity in cultures of cells obtained from amniotic fluid of the mother, a known carrier. The same general procedure is believed capable of detecting a fetus fully afflicted with this or other hereditary metabolic disorders at an early stage.

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*Hypoxanthine-guanine phosphoribosyltransferase.

We are drawing even farther away from the idea of heredity as inevitability. It is an established tenet of genetics that one does not, strictly speaking, inherit genetic characters, but only a susceptibility to them--that appropriate modification of the immediate environment in which a gene is operative could prevent or alter its expression. Stated otherwise, genes determine susceptibility to character formation. The effective environment for the formation of a character such as hair color, height, color blindness, or susceptibility to cancer may include intrauterine factors, diet, occupational influences--any condition, in fact, to which the individual is exposed; and it may include, secondarily, physiologic factors affecting cells. Thus the adverse environment, whether that of the individual or a susceptible cell, is not beyond control. Without overlooking the exceptions--the effects of totally absent genes and chromosomes, for example--the possibilities that might be opened by a research breakthrough in "orthogestation" are staggering.

Such thoughts lead inescapably to the possibilities of genetic engineering--"family planning" in a genetic sense. Certainly, all this carries us far beyond pediatrics as we know it today, but it can be viewed as within the framework of that field. As to the ethical implications, I agree with Dr. Philip Handler's statement at the recent Westinghouse Talent Search Award Dinner, that we should prepare now for the day when genetic engineering will be possible. Let us not underestimate the impact when this capability becomes available.

A rather large department of our future children's hospital will be concerned with child development; for it will be possible to alter growth and morphology in many meaningful ways. Control over child

development may prove an effective approach to preventing or delaying degenerative diseases of the later years. Indeed, "pediatric geriatrics" may emerge as an important subdiscipline.

A suggestion of the content of such a field is given by the recent observations of two NIH grantees, Drs. Jules Hirsch and Jerome L. Knittle of Rockefeller University. They found that early nutritional factors such as overfeeding, in both animals and humans, can produce severe obesity by permanently increasing the number of fat cells. These cells were more abundant in adults who had been fat for a long time, and weight reduction did not diminish the number. On the other hand, prison volunteers who became obese experimentally showed an increase in fat-cell size but not number. The number of fat cells appears to be established before adulthood.

Dr. Hirsch and associates, in further studies, found that the large fat cells associated with obesity have a diminished sensitivity to insulin, and that weight loss both decreases the cell size and brings plasma insulin levels to normal.

For "pediatric geriatrics," the implications of these studies are, of course, weight reduction in childhood as a means of preventing intractable obesity--and associated disorders--in later years.

The expanded role of the pediatrician in child development will call for a much broader background in psychology and sociology. Training will seek to correct present deficiencies in community medicine through greater emphasis on processes of learning, development, behavior. The practitioner will have to be more knowledgeable about his patient's social background; will have to relinquish some time-consuming mechanical functions, like the

taking of histories and the giving of injections; will need a broader scientific base; and will have to know a great deal as yet unknown about the mother.

The field of pediatrics will continue to be popular with women physicians. A recent analysis of trainees under NIH training grants in 1967 showed that 20 percent of 353 trainees seeking or holding an M.D. in pediatrics were women, as compared with only 10 percent in over-all clinical medicine. For the Nation as a whole, about 3000, or 18 percent, of active women physicians were specializing in pediatrics in 1965.* These and earlier data (1953) showing about the same percentage indicate that pediatrics remains the most popular specialty among women in medicine.**

So far, we have been looking ahead to what is often called the "foreseeable" future--a time predictable with relative confidence. If we attempt, now, to look ahead a century, the crystal ball grows dimmer and only the barest outlines are discernible. There is still a Children's Hospital and it is playing an important role in pediatrics. Through genetic engineering and highly specific prenatal care, the birth of an unwell child is a rarity. But the problem of keeping him well in an extremely complex environment is a tremendous responsibility, drawing upon knowledge yet unforeseeable about human society and the physical setting. Surely, pediatrics as we know it today will have long ago ceased to exist. But

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*The Fuller Utilization of the Woman Physician, p. 73. Report of a conference sponsored by American Medical Women's Association, etc.; Washington, 1968.

**Survey of Women Physicians Graduating from Medical School 1925-1940. Roscoe A. Dykman and John M. Stalnaker. J. of Med. Ed. 32, vol. 3, part 2, pp. 3-38, March 1957.

the pediatrician will be one of the principal agents in helping every child attain not only health and long life, but also his full potential as an individual.

But for the immediate future, let me return to the difficult question, the implied premise in my title--On what foundations can we build? or, as I stated it later, Where should we put our resources?

Margaret Mead said, "Our past experience may not be pertinent to future needs." Harvard, even Harvard, is struggling with that very question. But John Russell has said that the training of physicians was such an essential service that, even during a period of terrible strife, it was decided to continue to have "an ordinary program." In our own troubled times, Children's Hospital has continued to serve the entire spectrum of medicine from basic research to community service.

Yes, the problems of war, poverty, ignorance and disease are as much on our minds today as they were in 1869. Against this background, it seems to me that the highest priority of this venerable institution, of this Nation, and perhaps of mankind, is to do those things necessary to hasten the development of general theories that illumine life processes.

We are far along the way. Twenty years ago, the concept that a child with acute leukemia could live for a year was as remote as man's reaching the moon. Tomorrow the question of how far man can reach for the stars in his human aspirations will no more depend on therapies ministered in a piecemeal fashion than his ability to reach the stars in a spaceship will depend on the counting of each molecule in the atmosphere. Thus, we must push forward, with an optimism and enthusiasm characteristic of this Nation, to understand the processes of life and disease. Let it not be

said a hundred years from today that we lacked the courage or conviction of our forefathers, or that the essential limitation was a failure to commit our resources to such research.

TAB 19

#541

OUTLOOK FOR NIH SUPPORT OF MEDICAL EDUCATION AND RESEARCH

Background Information*

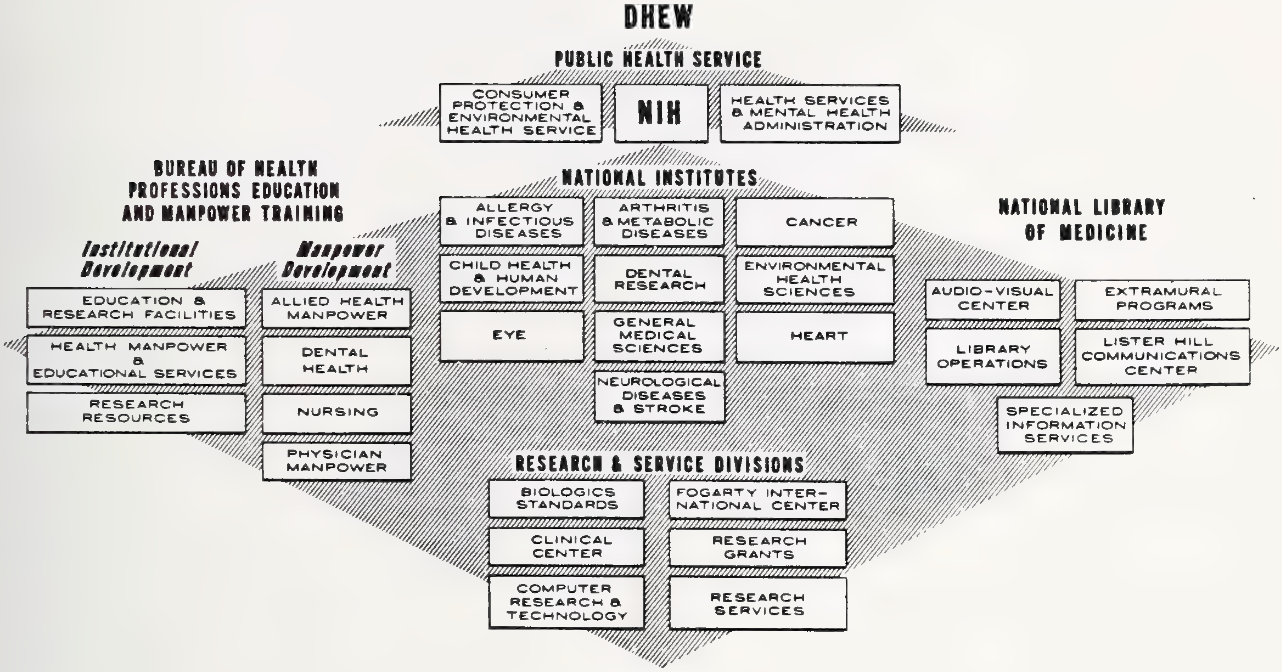
Robert Q. Marston, M.D.**

Page

*Prepared for meeting with Professors of Medicine, Atlantic City, N.J., May 3, 1969.

**Director, National Institutes of Health, U.S. Department of Health, Education, and Welfare.

Organization of the NATIONAL INSTITUTES OF HEALTH



The above chart represents the National Institutes of Health as now organized. A reorganization of the health components of the Department of Health, Education, and Welfare, effective April 1, 1968, resulted in the following changes:

- The Bureau of Health Manpower and the National Library of Medicine were merged with NIH. (BHM was subsequently expanded to include all construction grants and research resources programs of NIH, and was renamed the "Bureau of Health Professions Education and Manpower Training.")

- A Health Services and Mental Health Administration was established to include most other functions previously assigned ~~to the~~ Public Health Service (including the Regional Medical Programs of NIH).

- A Consumer Protection and Environmental Health Service, containing the FDA, was created as the third major component of an expanded and more comprehensive PHS.

- Direct authority over the new PHS was given to the Assistant Secretary for Health and Scientific Affairs.

Other organizational changes within NIH include:

- Establishment of the Lister Hill National Center for Biomedical Communications in NLM.
- Authorization of the National Eye Institute.
- Elevation of the Division of Environmental Health Sciences to a National Institute.

The top NIH staff is as follows:

Director	Robert Q. Marston, M.D.
Deputy Director	John F. Sherman, Ph.D.
Deputy Director for Science	Robert W. Berliner, M.D.
Director, Bureau of Health Professions Education and Manpower Training	Leonard D. Fenninger, M.D.
Director, National Library of Medicine	Martin M. Cummings, M.D.

Other members of the NIH Director's immediate staff:

Associate Director for Extramural Research and Training	Ronald W. Lamont-Havers, M.D.
Associate Director for Direct Research	Robert W. Berliner, M.D. (Acting)
Assistant Director for Collaborative Research	Leon Jacobs, Ph.D.
Associate Director for Program Planning and Evaluation	Thomas J. Kennedy, M.D.
Associate Director for Administration	Richard L. Seggel

Revision of the Fiscal Year 1970 Budget for the National Institutes of Health

(Summary--May 1, 1969)

Total obligations by source of funds (in thousands)	January budget	April revision	Change
Net unobligated balance carryover . . . . (mainly construction grants)	$26,874	$27,175	+$301
Net advance obligational auth. (BHPEMT)	25,640	28,140	+2,500
New budget authority*	1,491,990	1,456,365	-35,625
Total obligations**	1,544,504	1,511,680	-32,824

*Includes NIMH's share of General Research Support Grants.
**Excludes appropriation "Scientific Activities Overseas," which is not administered by NIH.

It will be noted that the cuts in the appropriation requests totaled $35,625,000. However, other technical adjustments, particularly a decrease in the use of advance obligational authority for student assistance in fiscal year 1969, reduces the net decrease in fiscal 1970 total obligations between the January and present budgets to $32,824,000.

The use of advance obligational authority represents a commitment against an appropriation to be made in the following year. This is specifically authorized by legislation for the provision of student assistance (scholarships, loans and traineeships).

The unobligated balances carried over from a previous year are mainly in the construction appropriations, which provide funds without regard to a given fiscal year.

The table which follows shows total obligations by organization and activity--i.e., appropriation requests plus unobligated balances carried forward and the use of advance obligational authority.

	1969	1970 January budget	1970 April revision	Change from 1969
Total obligations by organization and activity (in thousands)				
Institutes and Research Divisions				
Research grants*	$624,567	$642,029	$634,169	+$9,602
Training grants and fellowships	197,727	190,000	179,000	-18,727
Direct operations	264,513	275,610	266,549	+2,036
Subtotal, IRD's	1,086,807	1,107,639	1,079,718	-7,089
Bureau of Health Professions Education and Manpower Training				
Health manpower	206,660	245,464	247,161	+40,501
Institutional support	(93,446)	(123,859)	(128,859)	(+35,413)
Student assistance	(97,573)	(104,920)	(102,420)	(+4,847)
Other	(15,641)	(16,685)	(15,882)	(+241)
Dental health	10,185	11,888	10,887	+702
Construction of health education and research facilities	173,875	149,000	149,000	-24,875
Other	168	957	957	+789
Subtotal (BHPEMT)	390,888	407,309	408,005	+17,117
National Library of Medicine				
Grants	7,697	7,580	6,492	-1,205
Direct operations	12,478	15,302	13,890	+1,412
Subtotal, NLM	20,175	22,882	20,382	+207
Buildings and Facilities	14,795	6,674	3,575	-11,220
Total obligations**	1,512,665	1,544,504	1,511,680	-985

*Includes NIMH's share of General Research Support Grants, which totals in 1969, $7,755,000; 1970 January budget, $7,863,000; and 1970 revised budget $7,755,000.
**Includes balances as well as new budget authority.

Modifications of Program Under the New Budget

Training

The reduction in extramural training programs for fiscal year 1970--a reduction of $18.7 million below the 1969 figure--compels us to look at our training objectives and goals realistically. We are dealing here with two universes: the training of Ph.D.'s for research and the training of clinicians for research and academic medicine through our postdoctoral programs.

The reductions that we shall have to absorb in fiscal 1970 can only mean that the number of trainees and programs must be reduced. In order to protect the training environment during this period of fiscal constraints, which we hope is temporary, the fellowship program necessarily must absorb a proportionately heavier share of the reduction.

With reference to training in the clinical specialties, we are aware of the disparity that has developed between postdoctoral stipends and house resident salaries. We are seeking a solution to this difficult problem.

Notification was made by mail this week that NIH will now allow supplementation of Research Career Development Awards and Research Career Awards. This will permit an institution to raise the salary of an awardee to whatever maximum its policies provide. While we are not at present limiting the amount of such supplementation, we are proceeding with studies of the whole question of supplementation of these awards and what our proper role should be.

Clinical Research Centers

The problem of rising costs plagues the Clinical Research Centers program, and we are well aware of the need for some action. We are exploring ways to offset such costs, including the use of third-party payments. We are adamant, however, that the criteria for patient admission shall not be related to the ability to collect payments.

Research Grants

Research grants in fiscal 1970 will be increased by $9.6 million. This includes increases of $3.2 million for family planning research, $1.5 million for the new Eye Institute, and $4.9 million for non-competing grants and built-in requirements for the Heart Drug Study and grant-supported dental institutes.

Health Professions Education and Manpower Training

In the area of institutional support, the April budget revision adds $5 million to help medical schools increase enrollments in the 1970 academic year by approximately 1,000.

With respect to student assistance (traineeships, scholarships and loans), the 1970 budget provides an increase over 1969 of $4.8 million, primarily for expanded enrollments. The Department of Health, Education, and Welfare has indicated that some increases in loans to students in health professions schools are expected through the Guaranteed Student Loan Program of the Office of Education.

The budget for Dental Health Activities shows an increase of $0.7 million, primarily to support training of dental auxiliaries.

The 1970 estimates for construction grants are below those for this year, and include no funds for construction of separate research facilities. An increase of $10.8 million, however, is provided for construction grants to medical, dental and related schools.

National Library of Medicine

The 1970 budget for the National Library of Medicine is slightly above the 1969 level. The estimates for grants are $1.2 million below the 1969 level, and for direct operations (primarily MEDLARS) are $1.4 million above this fiscal year. A requested increase for the Lister Hill National Center for Biomedical Communications has been deferred pending development and approval of long-range plans for this program.

Buildings and Facilities (Direct Construction)

The fiscal year 1970 budget provides only for repairs and improvements.

TAB 20

YOUR GOVERNMENT AND YOUR MEDICAL SCHOOL*

Robert Q. Marston**

Twenty-two years ago, in the spring of 1947, I had the privilege of introducing Dr. Isidor Ravdin of Pennsylvania as the AOA speaker for that year. Men who had greatly influenced my life and were to continue to influence it, such as President Sanger, Dr. Porter in Medicine, Dr. Apperly in Pathology, Dr. Bigger in Surgery and many others, some of whom are in the audience today, were present then. So, too, were my colleagues in the student body. Dr. Ravdin delivered a splendid address on recent advances in surgery, and the Hippocratic oath was administered to the students selected for membership in AOA.

These pleasant associations have come to mind and I have chosen to mention them--if only because they concern people. When one speaks for the most part about large, complex institutions, he can easily forget that all institutions large or small exist for and through individuals.

Let me say how pleased I am to be back here. Although I have spoken often before the students and faculty of this distinguished institution, this, I believe, is the first time as an outsider. Quite frankly, it was easier to give a lecture on infectious diseases, or to discuss a patient,

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*Alpha Omega Alpha Lecture, Medical Division, Virginia Commonwealth University, Richmond, Va., May 23, 1969.

**Director, National Institutes of Health, U.S. Department of Health, Education, and Welfare.

or even to participate in a C.P.C., than to try to come to grips with some of the major issues of our times.

My primary purpose today is to explore with you how the National Institutes of Health is likely to affect your life and your medical practice in the future. To do so will require a brief review of the historical development of Federal mechanisms for the support of research and education in the health field, and of the trends in medical school development which have so markedly affected American medical education in recent years. It will then be possible to assess the present relationship between the schools and NIH--that agency of the Federal Government which is most directly concerned with advancing the Nation's medical knowledge, medical education, and through the National Library of Medicine, biomedical communications.

Admittedly, we are too close to the scene--a complex and dynamic scene--to hope for a definitive assessment. But I believe we can gain a clearer view of the relationship, the <u>interdependence</u> of your government and your medical school. Then we may see how that interdependence will probably affect your practice to a far greater extent than was true of earlier generations of physicians--how it may, in fact, be the main determinant of your medical career.

While the purpose of government is to serve the needs of the people, and the purpose of the medical school is to serve the <u>health</u> needs of the people, there are marked differences in the tools and mechanisms, the criteria of achievement, and the types of constraint imposed on the two. Indeed, one may marvel that the inevitable stresses and strains, errors and compromises, frustrations and disappointments of the collaborative

enterprise have not been overwhelming. Yet, in fewer years than have passed since I sat where you students sit, the cooperative efforts between NIH and academic medicine have resulted in magnificent achievements which have contributed, and will continue to contribute, richly to all mankind.

The scientific excellence growing from the unique relationship of government and academia in the health area has made the United States the world leader in the health sciences. More importantly, it offers, if wisely exploited, almost unlimited future benefits to all people for all time; for we do seem to be in the early stages of what has been termed "the biological revolution," and biomedical advances are the main pace-setters in this explosive phase of our increasing understanding of the nature of life itself.

Despite this progress, there are few among us who feel very comfortable about the state of the Federal Government or the state of the medical schools. Powerful divisive forces threaten the stability of institutions and the effectiveness of the Federal-university relationship. But now let us look at the history of the NIH enterprise and the parallel development of the modern medical school, with particular reference to their interaction and commonality of aim.

The nucleus of the NIH research program was a bacteriological laboratory established by Joseph J. Kinyoun at the Marine Hospital on Staten Island, New York, in 1887. Important advances were made from the start and continued to flow from the small laboratory and its successors in the Washington area--including, for instance, the Nobel-prize-winning work of Marshall Nirenberg. Some highlights of the early years which come to mind are--

- Kinyoun's diagnosis of bubonic plague in San Francisco--the first definite diagnosis of plague in this country.

- His demonstration of the organism of cholera in immigrants. (We still participate in the conduct of cholera research in Dacca.)

- The development of methods and standards for the production of biologic products, a responsibility of NIH since 1902. (This spring our Division of Biologics Standards will license rubella vaccine produced from an attenuated strain developed at NIH by Drs. Parkman and Meyer.)

- Joseph Goldberger's demonstration that pellagra, which caused up to 7000 deaths a year in the late 1920's, results from a dietary deficiency. (The current need for more accurate information on the relation of malnutrition to health is a reminder that even confirmed scientific facts seldom give all the answers.)

- R. R. Spencer's discovery of the cause, prevention and treatment of Rocky Mountain spotted fever.

- Trendley Dean's association of fluorine in drinking water with a low incidence of dental caries.

- Pioneer work on anaphylaxis, brucellosis, tularemia, St. Louis encephalitis, typhus fever, malaria, rabies, and various parasitic and fungus infestations.

While the early contributions to medical knowledge are significant and interesting, it was under the National Cancer Act of 1938 that research

and training awards were first made to non-Federal institutions on a scale characteristic of the modern era. At that time NIH headquarters were established at Bethesda, Maryland, with a modest building program under way.

Another milestone was the Public Health Service Act of 1944, which gave NIH the legislative base for the postwar program. With the National Cancer Institute as a prototype, NIH was now prepared to foster, conduct, support and cooperate in research relating to health and disease. Authority to award funds for non-Federal research and research training, hitherto limited to the field of cancer, was extended to health problems generally.

A major benefit deriving from the war period was the association of the Federal Government with the universities in the furtherance of wartime research. The Office of Scientific Research and Development, organized to coordinate and contract for this work, clearly demonstrated the contribution that university science could make to the solution of national problems. Early studies in atomic energy were conducted under OSRD sponsorship, and major health problems, such as malaria, were successfully attacked. As the war drew to a close, the new antibiotics no less than Hiroshima demonstrated what technology built upon basic science could accomplish.

High expectations for medical research in the solution of national problems were instrumental in the postwar decision to continue OSRD-sponsored projects under NIH auspices. The decision was far-reaching. It linked the basic biomedical research of the Nation's universities, medical schools, and other nonprofit institutions with NIH, the research arm of the Public Health Service with a firmly established mission-oriented program in the health field.

In 1948 the Congress authorized the National Heart Institute, the National Institute of Dental Research, and by a regrouping of older laboratories, the Institutes concerned with infectious and metabolic diseases. Further expansion occurred under the "Omnibus Act" of 1950, which added an Institute to study neurological diseases. In each case a program of research and training grants was established. Today, there are nine Institutes in major health-problem categories and a tenth concerned with general medical sciences.

In the evolution of this program for the support of research, the propagation of the mechanism for awarding grants has been most influential. Objectivity has been assured through National Advisory Councils composed of non-Federal leaders in science and public affairs, through Study Sections of the Nation's experts in the basic science fields, and through the requirement that grants must arise with a proposal by the investigator and can only be awarded with Council approval. Furthermore, the results of the research performed have been judged under the probing scrutiny of scientific meetings and the open literature. Thus, the character and quality of a significant part of the national biomedical research effort has derived from a unique process for reaching a consensus of the scientific community involved.

Today NIH is one of three major components of the health establishment of the Department of Health, Education, and Welfare. [Slide: organization chart of NIH.] A second component is the Consumer Protection and Environmental Health Service, which is concerned with environmental problems and regulatory functions like those of the FDA. The third component is the Health Services and Mental Health Administration,

responsible for the Federal Government's role in the organization and delivery of health services and for the entire Mental Health Institute, as well as for many of the traditional functions of the Public Health Service, such as the control of communicable diseases and the health care of Indians.

The broad mission of the National Institutes of Health, expressed in the next slide (2), now extends to four distinct fields: research, research training, education in the health professions, and biomedical communications. Although our Bethesda campus represents the largest research institute in the world, only 10 percent of our total funds are spent for intramural research. About 90 percent of the $1.5 billion budget is actually spent in universities and other institutions throughout the land. [Lights, please.]

Now let us leave NIH for a while to review the status of medical education. The early history--that is, before the Flexner study in the first decade of this century--is interesting, but does not warrent detailed treatment here. You are all familiar with the unstable situation represented by the fact that 357 schools had been organized in this country before 1900 and that 165 of them were in operation at that time. Illinois alone has been the site of 45 medical schools; and four states--Illinois, Missouri, New York and Ohio--account for 40 percent of all the schools that have been organized. Abraham Flexner's visit to medical schools between 1907 and 1910, as well as the increasing efforts of the profession itself, resulted in the merging of schools into fewer but stronger institutions.

Thus the development of modern medical centers, begun at the turn of the century, soon became an established trend. In 1910, there were only

66 approved medical and basic science schools left, and the number stood at 77 throughout most of the 1930's and '40's. Since the war, the number of fully accredited four-year schools has increased to 85.

But Flexner's work had another important effect. It fixed medical education and therefore medicine itself to the rising star of science. And it created the interlocking faculties, oriented toward the basic sciences, and the graduate school milieu which characterize the university-medical school complex.

These important substantive changes in medical education are well described in the report submitted by Lowell T. Coggeshall to the Association of American Medical Colleges in 1965. By way of summarizing, I quote three lines:

- "Medical education has increased in complexity."
- "Patient care has become a major medical school responsibility."
- "Research has grown dramatically in relative importance as well as in volume."

Dr. Coggeshall, in elaborating the last point, makes this cogent statement:

> Unfortunately, it is not generally recognized even today that teaching and research are almost identical components of the educational process. Together with the patient care involved in clinical education, instruction and research are the essential ingredients that make up "education" in the health and medical sciences. They are inevitably tied together. More and more research is being conducted, both for educational purposes and as intrinsic research. Many are expressing concern that research efforts be kept in proper perspective in the educational process.

Other outstanding characteristics of medical education today might be mentioned. One is that 9 out of 10 schools are affiliated with a university and that the relationships between the schools and their parent universities have been developing. Another is that full-time faculties, long provided in basic science departments, are becoming the norm in most clinical departments as well.

Looking toward the future of medical education, I should like once more to quote the Coggeshall report:

> The important question . . . is whether the present system is sufficiently flexible and imaginative to keep pace with the contemporary revolution in medical science and the changing expectations of the people of America. Specifically, in an era when the concern of society is turning from the protection of the interest of the individual practitioner to finding ways of meeting the aggregate health care needs and expectations of the people of America, the question arises whether new approaches to the education of physicians are not now called for.

You who are now in the midst of a curriculum revised in response to such needs will be especially attuned to these thoughts.

We are now prepared to return to the relation between the Nation's medical schools and the National Institutes of Health. By the time NIH had launched an extensive program of research and training grants in the late 1940's, the medical schools were prepared to expand their studies on the emerging chronic diseases, which had become a major national concern as mortality from infectious diseases declined and the average lifespan lengthened. In 1950, among all institutions, medical schools won in open competition more than half of NIH research grants, which totaled about $15 million. Last year 6,300 grants were awarded to medical schools

totaling $317 million for the conduct of research--again about half of our total research grant expenditure.*

In addition, NIH funds support an estimated 24,000 individuals for advanced training in basic science and clinical specialties. Another 32,000 receive scholarships or grants, and 29,000 receive student loans, for the development of manpower for the health and allied health professions.

Finally, the expansion of resources for medical research, education, and communications, as well as general institutional support, are major objectives of NIH programs. For example, NIH construction grants, together with matching funds, have added 17 million square feet of research space. In fiscal year 1969, NIH programs will award approximately $323 million for research and educational construction and general institutional support and about $113 million for the programs of clinical research centers, medical libraries, and other special resources.

The importance of all these programs to the medical schools is suggested by a single statistic which the AMA's Council on Medical Education and Hospitals has compiled: that the Federal Government paid 52 percent of the total expenditures of the schools in the year 1966-1967.**

We have followed the growth of NIH from a small laboratory studying infectious diseases to the largest research institute and the largest health granting agency in the world, with a mandate to advance medical

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*$626 million, including BHM and NLM.

**JAMA, Vol. 206, No. 9, p. 2020, November 25, 1968.

knowledge and capability against all the important diseases of man. Over the same period, medical education in this country has grown from a form of preceptorship to a highly organized, science-based profession strongly dependent upon the Federal establishment. In general, what has been the source of this tremendous development? NIH and the medical schools have grown in response to the wide recognition that a nation's technology really determines its position in the spectrum between undeveloped and advanced, and that the science base of medicine is the primary determinant of the quality of health care. NIH dollars, its policies, and the impact of Congressional and Executive decisions have had a profound effect on medical schools. At the same time, academia has played a significant role in shaping NIH.

NIH has been viewed as a national effort which stands above partisan politics, having been sponsored and supported by leaders in all parties. Thus, while operating as a Federal agency in the American governmental process, it is also highly responsive to judgments and decisions of knowing nongovernmental consultants, more than 2000 of them sitting in study sections and councils. It has achieved its purposes through a unique relationship with the medical schools and universities--a relationship that takes full cognizance of the total environment for research and education through programs of construction, basic institutional support, and student assistance.

Moreover, there is a brisk--though, at present, too one-sided for my comfort--interchange of personnel between NIH and academia. Consider also that the bulk of NIH activity is proposed by academic investigators and only modified by Government scientists in their concern for the

accomplishment of Institute missions, with the result that our support is largely out of the hands of the bureaucrats.

This resumé will suffice to establish my first thesis--the firm interdependence of the medical schools and the National Institutes of Health. But why did I also assert that this interdependence "will probably affect your practice" to a great extent, and may even be "the main determinant of your medical career"?

It has been clear for at least four years, that both the National Institutes of Health and the medical schools of the Nation are facing a major crisis. To some degree it is a money crisis, for all schools are having financial problems as they are asked to do more while Federal funds, having first leveled off despite continuing increases in costs, are now actually decreasing under the strains of Viet Nam and a serious problem of inflation.

These fiscal constraints have assumed critical proportions as important research and training programs are curtailed or deferred. NIH is deeply concerned about the necessary imposition of these constraints on our research, educational, and medical library programs at a time in history when the capacity to provide more and better health care is being requested. None who have watched the growing seriousness of dollar shortages on NIH programs in recent years could fail to be alarmed.

But to be candid, there are problems other than fiscal problems. Indeed, it was in 1965 that I entitled a commencement address at the University of Arkansas "To Turn a Corner." The succeeding years, while you seniors have been in medical school, surely have been filled with more tumult and concern in medicine that one could have predicted even then.

It is tempting to suggest that the main problems are peripheral to the primary goals and responsibilities of medical institutions and agencies. But the medical schools and NIH impinge on and are influenced by three at least partially external universes, each itself at the vortex of pressures for change. First, the universe of education generally. Second, the whole field of science, including physical, biological and social sciences. And third, the whole field of health services.

Can you think of three more dynamic universes? Students entering medical school from undergraduate schools are already different from most of you, I am told. From recent meetings with representatives of SAMA, I have learned that they believe these changes are as profound as those of some major student movements of the past. It is far too early to know if it is a remotely appropriate analogy, but listen to this complaint from Archbishop Warham to Cardinal Wolsey in 1521:

> Please it your Grace to understand that now lately I received letters from the University of Oxford; and in those same certain news which I am very sorry to hear. . . . It is a sorrowful thing to see how greedily inconstant men, and especially inexpert youth, falleth to new doctrines be they never so pestilent; and how prone they be to attempt that thing that they be forbidden of their superiors for their own wealth. . . . Pity it were that through the lewdness of one or two cankered members which as I understand have induced no small number of young and incircumspect fools to give ear unto them.

Warham's words referred to the infiltration of Lutheran ideas among Oxford undergraduates. Within 10 years, the reformation was firmly established. Historical analogies are usually fallacious, yet the worldwide student revolution in the universities has already affected the way we think and act.

With respect to science generally, we see a growing impatience, hear accusations of dilettantism and lack of relevance to a wide range of urgent social problems. We are pressed to shape our research programs toward short-term practical goals, or to discontinue them altogether, on the assumption that the meager resources so released will alleviate the societal problems. There is a rapidly growing disinterest in science and scholarship and a mounting anti-intellectualism which carries a special and alarming danger and leads me at times to wonder if we shall soon need an equivalent of the monasteries of the middle ages!

All of this comes at a particularly bad time for biological science and its subset biomedical science. For by all objective criteria, this should be a time for optimal, not severely limited, investment of resources in research. Ten to twenty years ago the venture capital was invested, and today we know, not hope, that significant progress can be made in genetics, atherosclerosis, virus cancer, dental caries, and many other areas.

Finally, with respect to health services, the Federal establishment and the schools are in the throes of developing new medical delivery systems, with great pressure to meet the health needs of the under-privileged. In a period of budget constraint, in the din of rebellion and turmoil, we must beware of the forces that divide. Nor should we lose sight of our main objective in the drive to buy more with less, to take the cash and let the credit go. We must beware of the diluting effect of well-motivated but ineffectual attempts to minister without requisite knowledge and skill, to substitute compassion for competence--or one might say, of building with straw instead of bricks. Yet the organizations

we are discussing today must constantly reevaluate their priorities and roles in respect to medical research, health manpower, and their relevance to the delivery of effective services from prevention to rehabilitation.

These thumbnail sketches of the turmoil and sense of change in the universes of education, science and health may suffice to illustrate that it is precisely during times of upheaval and change that "change agents" such as scientific and educational organizations should be most valuable.

Let me now try to relate these thoughts to your future careers.

To date and for at least the period of your house-staff training, the NIH-medical school influence will clearly dominate all others. Once you are in practice, however, other influences both government and nongovernment will obviously have far more direct influence on you, for the practice of medicine is essentially--now and will remain, I think--a function of the private sector. Such Government programs as Medicare, Medicaid, Comprehensive Health Planning, Regional Medical Programs, and perhaps the National Center for Health Services Research and Development and OEO will seem more closely related to your life. Similarly, such nongovernment influences as the community hospital, physicians and other colleagues, availability of labs, consultants, referal options, health departments, and local health organizations will have an immediate professional impact.

For most of my fellow students, the NIH-medical school type of thing faded softly into the background of real life during at least the first ten years after graduation. Mildly interesting, occasionally helpful, generally approved, but not really essential to the practice of good medicine. Antibiotics came and went, cortisone was a problem, the

criteria for referral for surgery became more complicated, lab tests increased; but everyone was better trained, and progress in transportation and communications kept up.

Today, in contrast to ten years ago, physicians do want to know their relation to medical centers, the relevance and mode of availability of recent advances in medicine, and the policies for encouragement of more numbers and types of physicians, dentists, nurses, and allied health workers. As medicine becomes more complex, as it must, these questions will become more urgent.

Thus, I firmly believe that your professional lives will indeed be influenced most of all by--

- New knowledge and
- The nature of our medical schools.

Of course, there will, and should, be other forces, some of which will have considerably higher day-by-day impact.

But in analyzing where we are today, I shall return once more to the theme of the interdependence of NIH and the medical schools and now to you as individuals. Here, Benjamin Franklin's words at the signing of the Declaration of Independence are apt: "We must all hang together, or assuredly we shall all hang separately." For we are faced with greater demands than ever before to deliver high-quality medicine to more people in a complex world, with strongly competing societal needs. We can only hope to meet those demands through understanding and respect for each other's goal and methods, strengths and deficiencies. In 1886, John Shaw Billings had these words to say before the British Medical Association:

> In one sense medicine, as we have it to-day, is the result of co-operation, not of deliberate centrally planned and direct co-operation, but of natural selection from results produced by many men, often working at cross purposes and, therefore, wasting much energy, but nevertheless working, though blindly, to a common end. And it is safe to predict that in the future much of the best work will be done in the same way, by individual effort inspired by the love of science, by personal ambition, etc. But the results obtained in this way come slowly, and some things that we want can hardly be obtained by individual effort, even if we were willing to wait; hence we must look to organization for help.

In closing, let me say again how pleased I am to be here to express my congratulations on your initiation into AOA.

TAB 21

REQUISITES FOR ADVANCES IN HEALTH*

Robert Q. Marston, M.D.**

Dr. Richmond, members of the graduating class, wives, husbands and families of the graduates: It is a pleasure to be with you on this happy occasion marking the completion of your studies and the award of degrees in medicine, graduate medical sciences, and nursing--degrees that will identify you in a very special way throughout your life.

You are entering your professions at an exciting time--a time when traditional approaches to the healing arts are undergoing severe challenge, when public expectations for health are changing rapidly, when knowledge is expanding at a remarkable rate, and when the demands for trained manpower are straining the resources of medical and other health schools as never before. An excellent assessment of the professions you enter today is contained in the book Currents in American Medicine, by your dean.[1] He begins by stating--

> It is therefore the objective of this presentation to attempt a historical analysis of the evaluation of medical services, education, and research in the United States since 1900 and, on the basis of this analysis, to raise questions for the future development of medicine as an institution in our society.

The health professions have been placed in their present position by two forces. One is the scientific revolution that has transformed

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*Commencement Address, State University of New York, Upstate Medical Center, Syracuse, N.Y., May 25, 1969.

**Director, National Institutes of Health, U. S. Department of Health, Education, and Welfare.

medicine; the other is the social revolution, with its belief in health as an attainable condition of man. It is the impact of these two powerful forces which will determine more than anything else the nature of your professional practice over the last quarter of this century.

To the incessant prodding of these forces will be added the traditional pressures on mind, body and spirit to which physicians, nurses and others in the health field have been subjected since the beginning of our profession. You have already been introduced to your lifelong companions of fatigue from overwork, unfair criticism, undeserved idolatry, and the realization that failure must inevitably be the final outcome of even your best efforts on behalf of your patients. These things one can predict with accuracy, but these things you already know.

In examining the requisites for advances in health, I should like to focus on the question of what is expected on the one hand, as compared with what can be delivered on the other.

Some would say that health is the basic essential on which all other human aspirations are built; others, that it is a matter of competing priorities among desirable human goals. Some say health is a right; a few, that it is a privilege. Some say that every American should have the best health care available, and others say that this is unrealistic. All seem to agree that we should do the best we can--whatever that means.

Some idea of what this <u>may</u> mean can be seen from a recent Lou Harris survey. And though this is a bit like carrying coal to Newcastle, with Dr. Richmond here, let me touch on some of the highlights. This survey of the health needs and problems of the Nation and of special poverty

groups was drawn from a national sample of 1,057 adults in households across the United States. A frequently quoted comment is that of a Negro sharecropper in Mississippi. When asked about the state of his health as he sees it, he had this to say: "People just didn't used to be sick as much as they are today. They died when they got sick and didn't live sick."

For two-thirds of the people in the total population under study, "feeling fine" meant that nothing was the matter with them, but for two-thirds of the urban ghetto blacks and the rural poor whites, it meant literally "not as sick as usual." The survey confirmed the relationship between poverty and illness found in other studies.

But while the unfulfilled needs for health services are seen most clearly among the poor, perhaps the most striking conclusion of the Harris survey is the widespread concern among all groups. Here I should like to quote a few sentences from the report: "The economic apprehensions over health are abiding and deep. They may be far more acute for the poor, but for somewhere over one family in every three of the country, they are serious." Another observation was phrased thus: "A major cry emerging from the American people today is over the shortage of available doctors." And a final quote: "In its own pragmatic way the American public usually solves its problems by letting them get worse before they get better. In the case of health, there are many signs that the situation is widely believed to have become worse." All of this despite the overwhelming fact that doctors have consistently emerged at the top in public confidence and continue to do so in this study.

I do not propose to rest my case on a single survey, but the foregoing is another voice in the chorus each of us has been hearing in recent years--namely, that all of us want to do a better job in health. These voices come with essentially the same message, whether from the Congress, from students, from marchers in the poor peoples' campaign, from physicians, or from almost any group one can think of. And this is not new. Indeed, I have on my desk an African witchcraft set to remind me there are other approaches to health. The bottles contain various animal fats which are applied in small quantities to the hands, arms and face. A combination of fats rubbed into the scratches and gashes on the arms is supposed to give strength, while seal oil applied to the face influences general happiness and health. For treatments like this a practitioner may charge as much as the average native earns in a month of hard work. So we see that the desire for health care and the willingness to pay for it are old and widespread.

What is new and increasingly demanded is the availability, when needed, of the full array of science-based medical capabilities. The demand is for expertise and competence--compassionately delivered, to be sure--but it is not for tender loving care alone. And thus we find ourselves in strange dialogues concerning quality and quantity--of research versus teaching versus service. And during a time of budgetary restraints, such as those occasioned by inflation and the involvement in Vietnam, people think of trade-offs, despite the fact that dollar and human resources are of a different order of magnitude as between, say, research and service. Even if we shifted all research and medical education activities into the service area, we would increase only slightly the

number of physicians primarily engaged in practice--from 290,000 to less than 300,000. Similarly, the half billion Federal dollars going annually to medical schools for research and education, if applied to the health problems of New York State, would probably not cause a significant upswing in the level of health care.

Thus, while most would agree that significant changes in the organization and delivery of health services will have occurred in this country by the time you graduates are firmly established in practice, we are still struggling to identify those essential requirements for whatever series of "systems" are to emerge. One of the requisites will surely be a sound educational system, not just in the medical and other health schools of the Nation but in universities at large.

Here, we have a crisis. Professor S. J. Tonsor of the University of Michigan, in discussing alienation and relevance in higher education, talks of the striking parallel between the crisis in Government at the national level and the crisis in the university. "Each," he says, "finds itself alienated from its constituency. Each has discovered that it is increasingly difficult for it to project an objective which will move men to its single-minded pursuit. It is not that men no longer believe in government and education. Indeed, they believe passionately in both. It is rather that they no longer understand either the purpose or the designs of big government or of big education . . .

"It must be said at the outset, and the fact faced with candor and resolution, that the most important problem which higher education faces today is the growing wave of irrationality and anti-intellectualism

which has caught up large numbers of both students and professors . . . both the extreme right and the extreme left hold the same destructive view. Both Mark Rudd of Columbia and Governor Wallace of Alabama stand in the schoolroom door, and seen from the vantage point of the academy they both hold the same low view of reasoned discourse."

These points seem equally applicable to the university and its medical school. But Prof. Tonsor goes on to say that the only sound test is whether research on the one hand and community service on the other enhance or diminish the primary teaching function of the university.

Let me say, without engaging in the argument concerning the university, that this view does not apply to medical schools. In medical schools, research and service are so intertwined with the educational process that no simplistic separation is possible.

Paralleling the changes in education generally are the changes in the broad area of biological science, and not just that portion which is a necessary accompaniment of the educational process. As one looks across the whole field of science, it does appear that the area of greatest advance over the next few decades may be the biological sciences. Such predictions necessarily require that we go beyond established facts. But let me mention several areas and then concentrate on two.

One thinks immediately of the unfolding field of genetics. Already such techniques as chromosomal and biochemical analysis of amniotic cells early in pregnancy, as well as similar studies on the white cells of parents, allow a degree of sophistication in genetic counselling which none of us conceived as being a part of medicine even a few years ago.

Again, competent investigators feel increasingly confident that our accumulating knowledge of the biology of cancer, particularly in its relationship to viruses, will predictably allow rapid advances. Or again, the reawakened interest in interferon and infectious diseases goes beyond the search for a cure for the common cold to a broader appreciation of basic life processes involving nucleic acids. You could all suggest additional areas where the promise is great.

However, I should like to speak at somewhat greater length about that state of the art in two major disease areas in which it appears to me that the combination of biomedical research and practice will be closely related over the next few years. I do this even at the risk of saying some things familiar to many of you, because we do need to think specifically lest we become so diffuse that we contribute little more than the witch doctor with his bones and oils. I have chosen a major cause of death under age 65 and an almost universal, serious but nonfatal health problem.

The first area is coronary heart disease. The research assault on this prevalent disorder is being carried on in many institutions, and some of the recent advances have captured the imagination of the American people. Coronary intensive-care units are indeed decreasing mortality and changing the nature, sophistication and expectations of practice. Surgical procedures to augment the blood supply to the myocardium, the creation of bypass pumps to provide temporary aid to the failing ventricle, and heart transplantation are almost as well known to lay as to professional groups.

But the widespread interest in these approaches, and the fact that we are learning more and more about the heart in the process of the

surgical tour de force, still do not promise a realistic, practical and ultimate answer to the biggest single threat to one's expectancy for a long and useful life. We must look deeper into the problem.

About 1.8 million Americans die each year. A million of these deaths are due to failure somewhere within the cardiovascular system. But man, being mortal, must die of something, and I would focus attention on a smaller number who die relatively early in life from cardiovascular disease. For the sake of argument, let us say that age 65 marks the limit of premature death; and by this somewhat arbitrary criterion, there are about 270,000 premature deaths from cardiovascular disease each year in the United States, chiefly from coronary artery disease, strokes, and hypertension.

Progress has been made against hypertension through use of drugs, but we have had little success in preventing coronary artery disease. Each year some 170 thousand people die from this cause before the age of 65. It is our Nation's single largest cause of premature death.

It is also largely responsible for the disproportionate number of premature deaths in men as compared with women, for the mortality from coronary heart disease among men under 65 is nearly three times that among women in the same age group.

Further evidence that many of these premature deaths need not occur is the fact that our death rate for males aged 35 to 65 is more than double the Swedish death rate--unless the Swede moves to this country. Swedish migrants to the United States gradually develop cardiovascular mortality patterns increasingly similar to those prevailing here.

For all intents and purposes, the cause of the heart attack is atherosclerosis, and we know of three extremely common and potent risk factors:

- Elevated blood lipids
- High blood pressure
- Smoking

Other factors such as metabolic disorders--notably diabetes, obesity and sedentary living--increase the risk, but to a much lesser degree.

Today there are effective, though not ideal, blood-pressure-lowering drugs; and cigarette smoking can, at least theoretically, be eliminated, with adequate motivation. Thus the focus has turned increasingly to the problem of blood lipids as the factor most consistently associated with increased risk of coronary heart disease.

Until recently two major problems existed. First, the simple cholesterol level did not give the information necessary for either an accurate diagnosis or a plan for optimal treatment. The second problem was that to get such information was so costly as to be impractical. Recently, however, the results of paper-strip electrophoresis have been correlated with ultracentrifuge classifications of blood lipid abnormalities. Using this simple inexpensive methodology, it has been possible to separate high-lipid levels into five laboratory groups which correlated with clinical patterns. The extension of the use of this system to general practice is now being tested.

An example of the problem is seen in the coronary drug project of the National Heart Institute, which is evaluating the effectiveness of four lipid-lowering drugs in improving long-term survival among men who have previously experienced one or more heart attacks. To demonstrate this unequivocally in a group at highest risk requires more than 8,000 volunteers, a follow-up period of five years, and an outlay of some $35 to $40 million. Remember now that the result may show no effect from any agent.

Soon, I fear, we shall have to make decisions concerning the advisability of mounting a definitive study to determine whether changes in the American diet can significantly influence our morbidity and mortality from coronary artery disease. To conduct such a study in an open free-living population might require 30- to 50,000 participants and cost up to $30 million a year for five years or more. In these, the cost of field trials and related studies to verify existing hypotheses of causation, prevention, or clinical management is nearly always extremely high. But remember that in the area of coronary artery disease we are playing for extremely high stakes.

Let me return briefly to something I said earlier about the health problems of the poor. They have more illness than the rich. Indeed, they have four times as many heart condition cases as the highest income group and six times as many cases of high blood pressure.

A requisite for improving the health of the coronary-prone individual, rich or poor, is the type of research stretching from the ultracentrifuge to the field trial that I have just described. One can delay or defer such studies; and quite frankly, under the type of dollar constraints that we are experiencing at present, they will be delayed or deferred. But eventually we must have additional information if this type of advance in health is to occur.

The other major health problem that I wish to examine is dental disease. It is illustrative of the mood of the country that more and

more Americans are looking beyond the dramatic killing diseases to everything that affects the quality of life. A recent survey of unmet health needs ranks tooth decay beside poor hearing and failing eyesight. In another survey, more than 3 of every 4 people interviewed agreed that every person has the right to receive needed dental care, free of cost, if he cannot afford to pay for it. These findings, needless to say, point up the significant socio-economic overtones associated with the growing awareness of the importance of dental health.

The dimensions of the problem are such that professional and auxiliary manpower resources, even if substantially expanded, could not begin to meet all the needs. Dental caries alone, which affect 98 percent of the American population, occupies over half of the average dentist's time. It afflicts 50 percent of children under two years of age, and its ravages extend into the adult years. Its impact on productivity is best documented in the experience of the Armed Forces. One out of every eight men fighting in Vietnam has to be pulled out of the line, for up to five days, because of some dental emergency. Of these cases, more than 80 percent are the result of decayed teeth that must be extracted or restored.

Thus, by such measurements, dental caries would certainly be identified as a major national health problem. An assessment of its characteristics also reveals it to be a biological problem whose

solution does not rest in conventional treatment, which at best arrests decay or restores tissue lost to disease. The successful use of fluoride in community drinking water illustrates the biological approach.

Thus, the solution to the caries problem cannot be sought in the dentist's chair alone, and we cannot expect that it will come about automatically. An example of how a great deal could be accomplished by other means might be the extension of fluoridation, which has been shown to reduce tooth decay up to 65 percent in children. From a practical standpoint, however, other measures must also be taken, if only to provide protection to older age groups and those in communities where water fluoridation is not feasible.

I might add that more also needs to be done to assure greater public acceptance of both existing and forthcoming preventive measures.

Fortunately, the upsurge in social demands for health care has been paralleled to some degree by the development of a science base which will permit further advances against dental caries. The prospect for success of an accelerated, concerted attack against this disease would appear to be highly promising. A beginning has been made at NIH in giving direction and visibility to this effort through the creation of a Caries Task Force. This task force takes off from a base of knowledge that tooth decay is a typical infectious process, resulting from a characteristic group of bacteria that reside on the teeth and produce acid destruction by fermenting dietary carbohydrates. Control of this disease thus depends upon--

- The development of an enhanced resistance of the tooth itself to acid attack,
- The elimination or control of the microbial plaques involved, and
- A reduction in the fermentable and plaque-supporting ingredients of the diet.

It is believed that by mounting a vigorous research program on this foundation of knowledge, caries can be completely preventable within the next decade.

Some of the research proposals being examined by the task force include the substitution of other sugars for decay-causing sucrose, the use of phosphates as food additives, the development of antibiotic and other chemical agents against plaque, the development of new techniques for topical fluoride application, and the sealing of occlusal surfaces by adhesive materials.

One of the preventive approaches now being tested under the leadership of the task force relates to the use of an enzyme, dextranase, to dissolve the bacteria-laden plaque. Acids secreted by bacteria trapped in this film constantly bathe and eventually dissolve the enamel on the smooth surfaces of the teeth. Caries has been almost completely prevented in hamsters by incorporating small amounts of dextranase in their food and water. If these results in animal trials are borne out in humans, this would represent one of the more significant contributions to preventive dentistry in recent years.

The requisites for advances in health are of course varied and multiple. The first and most important is the continued attraction of talented and dedicated individuals to the field of medicine. Then, institutions such as medical schools must be maintained and strengthened. The knowledge base must be expanded as a high priority. Critical manpower shortages must be overcome. We must find better ways to utilize limited resources, human and otherwise. And all of this at a reasonable cost.

But I've tried to go beyond these points today--

- To suggest that the next few years hold unparalleled promise as the "biological revolution" gains momentum and
- To explore briefly two major health problems which exemplify the complexity of disease prevention and control for the future.

No vaccine or single drug will emerge to eliminate premature coronary artery disease or dental caries--yet the outlook, if adequate resources are deployed, is most encouraging.

Quite frankly, neither the forward march of science nor enlightened social pressures have yet reached the critical point where one can view optimistically similar progress in population control or environmental and behavioral problems of man.

One can identify areas for profitable attack in our national health problems, and even devise plans for moving against them; but our

success will be directly proportioned to the support obtained. Well-trained scientists and educators, adequately implemented and working in concert in various academic and research environments, are the backbone of such a program; and the knowledge and skills derived will be applied by well-prepared professionals like yourselves. Such an endeavor may be expected in time to exert a marked impact, not only on the quality and cost of health care but also on the solution of major health problems in this country.

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TAB 22

SCIENCE AND SERVICE: THE ROLE OF NIH AND THE MEDICAL SCHOOL*

Robert Q. Marston, M.D.**

This is an important day for each of us here, but also for the broader community which you will serve as physicians and scientists.

As I was having some final thoughts this morning about my remarks for today, I received a call from one of your local radio newscasters. This reporter asked if I could give him a one- or two-minute summary of what I planned to say. My response was along these lines:

I feel generally optimistic, I said, about the future of medicine in this country and about our capacity to respond to society's needs over the next decade or two. I am encouraged by the high caliber of people entering medicine and by their dedication to the cause of better health. I am also encouraged by the momentum we have generated in research as we enter this revolutionary era which many in science are calling the Age of Biology. And finally, I am deeply gratified by the progress we have made in developing institutions capable of supporting the kind of health programs our people expect today. It would be my purpose to discuss the role of those institutions, or more specifically, of our medical schools and the National Institutes of Health.

Two health problems which I propose to draw upon for examples--largely because they explain the optimism I have indicated--are coronary

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artery disease and dental caries. They will be viewed within the institutional context I have just alluded to: our medical schools and their relationship to the Federal Government, particularly NIH. They will also be viewed as an expression of public expectations in the field of health--expectations that will increasingly influence our entire medical establishment.

Public expectations concerning medicine are reflected, for example, in a recent Lou Harris survey, from which I should like to quote briefly. "The economic apprehensions over health," reports Harris, "are abiding and deep. They may be far more acute for the poor, but for somewhere over one family in every three of the country, they are serious."

Another observation was phrased thus: "A major cry emerging from the American people today is over the shortage of available doctors." And finally, "In its own pragmatic way, the American public usually solves its problems by letting them get worse before they get better. In the case of health, there are many signs that the situation is widely believed to have become worse."

The survey also showed, however, that doctors have consistently emerged at the top in public confidence.

The expectation is for science-based, high-quality health care--for quality as well as quantity. This expectation comes at a time when biological science is progressing rapidly. People speak of a revolution in this field because the advances looming on the horizon augur a commanding position for biology in the period ahead. Much will depend, of course, on advances stemming from fundamental studies--and these are largely unpredictable. But let us look for a moment at some fields where we know advances will take place.

One thinks immediately of the unfolding field of genetics. Already such techniques as chromosomal and biochemical analysis of amniotic cells early in pregnancy, as well as similar studies on the white cells of parents, allow a degree of sophistication in genetic counselling which none of us conceived as being a part of medicine even a few years ago. Again, competent investigators are increasingly confident that accumulating knowledge of the biology of cancer, particularly in its relationship to viruses, will allow rapid advances in this field. The reawakened interest in interferon and infectious diseases goes beyond the search for a cure for the common cold to a broader appreciation of basic life processes involving nucleic acids. You yourselves could suggest additional areas of great promise.

One of those would almost surely be the problem of cardiovascular disease. I refer particularly to the problem of disability and premature death. There are one million cardiovascular deaths each year in the United States; but man, being mortal, must die of something, and I would focus attention on the 270,000 cardiovascular deaths among those under age 65, of which 170,000 are due to coronary artery disease alone. In that age group, fatality from coronary artery disease is nearly three times as high for males as for females. Furthermore, the death rate for males under 65 in this country is much higher than in several other parts of the world.

To all intents and purposes, the cause of heart attacks is atherosclerosis, and we know of three extremely common and potent risk factors: elevated blood lipids, high blood pressure, and smoking. Other factors, such as metabolic disorders--notably diabetes, obesity and sedentary

living--increase the risk but to a much lesser degree. Today there are effective, but not ideal, blood-pressure-lowering drugs; and cigarette smoking can, at least theoretically, be eliminated with adequate motivation. Thus focus is turned increasingly to the problem of blood lipids as the factor most consistently associated with increased risk of coronary heart disease.

A relatively simple, inexpensive technique has recently been developed for separating high lipid levels into five laboratory groups which correlate with clinical patterns. Extension of this system to general practice is now being tested. Furthermore, the effectiveness of four lipid-lowering drugs in improving long-term survival among men who have previously experienced one or more heart attacks is being evaluated through the coronary drug project of the National Heart Institute. To demonstrate this unequivocally in a group at highest risk will require more than 8,000 volunteers, a follow-up period of five years, and an outlay of some $35- or $40 million. Also, keep in mind that the result may show no effect from any agent. Such research is expensive, and does require the cooperative efforts of laboratory scientists, practicing physicians, and the patient himself.

Even more difficult decisions confront us in the next few years if we wish to determine whether changes in the American diet can significantly influence our morbidity and mortality from coronary artery disease. To conduct such a study in an open, free-living population might require 30- to 50,000 participants and cost up to $30 million a year for five years or more. Although these costs are high, we must remember that they are minuscule compared with the price we pay for coronary artery disease,

and that we must have accurate information before we can presume to recommend profound changes in the way people live.

The other major health problem I wish to examine is dental caries, a disease that affects 98 percent of our total population, 50 percent of our children under two, and occupies over half of the average dentist's time. The solution to this problem cannot come from the dentist's chair alone. Accordingly, we have established a dental caries task force to explore the feasibility of a concentrated research attack.

This task force starts with the knowledge that tooth decay is a typical infectious process, resulting from a characteristic group of bacteria that reside on the teeth and produce acid destruction by fermenting dietary carbohydrates. Control of the disease might be achieved through development of an enhanced resistance of the tooth itself to acid attack, as by the more effective use of fluoride. Another approach is through elimination or control of the microbial plaques by use of antibiotics or the enzyme dextranase. Still another approach is through reduction in the fermentable and plaque-supporting ingredients of the diet, especially sucrose. It is believed that a vigorous research program built on this foundation of knowledge can render dental caries completely preventable within the next decade.

This brief examination of two major health problems, coronary artery disease and dental caries, is sufficient to demonstrate that better health will depend on many things ranging from the research laboratory to preventive medicine, from professional education to community action. At the same time, better health will be vitally influenced by the nature of the relationship among organizations,

professions and individuals. A special relationship of interest to all of us on this day of your graduation is that of your government and your medical school. Let me explore the development and growth of each of these universes.

The nucleus of the Government's research program of biomedicine is the National Institutes of Health, which started as a bacteriological laboratory under Joseph J. Kinyoun at the Marine Hospital on Staten Island, New York, in 1887. Important advances were made from the start and continued to flow from the small laboratory and its successors in the Washington area--including, for instance, the recent Nobel-prize-winning work of Marshall Nirenberg. Today, the broad mission of the National Institutes of Health extends through four distinct fields--research, research training, education for the health professions, and biomedical communications. Although our Bethesda campus represents the largest medical research institute in the world, only 10 percent of our $1.5 billion budget is actually spent for intramural studies. The rest goes to universities and other institutions throughout the country.

The modern medical school grew from the unstable situation represented by the fact that 357 schools had been organized in this country before 1900 and that 165 of them were in operation at that time. Following Abraham Flexner's report, this number dropped to only 66 approved medical and basic science schools in 1910. But Flexner's work had another important effect. It fixed medical education, and therefore medicine itself, to the rising star of science. And it created the interlocking faculties, oriented toward the basic sciences as well as patient care, which characterize the university-medical school complex of today. The

history of these modern institutions is well described in the report submitted by Lowell T. Coggeshall to the Association of American Medical Colleges in 1965. By way of summarizing, I quote three points:

- "Medical education has increased in complexity."
- "Patient care has become a major medical school responsibility."
- "Research has grown dramatically in relative importance as well as in volume."

By the time NIH had launched an extensive program of research and training grants in the late 1940's, the medical schools were prepared to respond. Thus in 1950, among all institutions, medical schools won in open competition more than half of the NIH research grants. Last year 6300 grants totaling $317 million were awarded to medical schools for the conduct of research--still about half of our total research grant expenditure.

In addition, NIH funds support an estimated 24,000 individuals for advanced training in basic science and clinical specialties; another 32,000 receive scholarships or grants; and 29,000 receive student loans for the development of manpower for the health and allied health professions. About $323 million will be awarded in 1969 for research and educational construction and general institutional support. Another $113 million will be awarded for the programs of clinical research centers, medical libraries, and other special resources.

The importance of all these programs to the medical schools is suggested by a single statistic which the AMA's Council on Medical Education and Hospitals has compiled: that the Federal Government paid 52 percent of the total expenditures of the schools in the year 1966-67.

These programs represent a vital link between NIH and medical education. While NIH funds, policies, and the impact of congressional and executive decisions have had a profound effect on medical schools, academia has played a significant role in the shaping of all NIH programs. For instance, more than 2,000 individual consultants, outside of government, review grant proposals and supply expert advice on the allocation of resources.

Under law, no grant can be awarded by NIH unless a nongovernmental National Advisory Council has recommended approval. It can be safely said that the expansion of knowledge which has taken place in the past two decades, and the deeper understanding of the biological and medical sciences which derives from this, have far exceeded expectations. Not only have the biology books been rewritten, but medical texts reflecting the information on which medical practice rests bear virtually no resemblance to those published before World War II.

In considering the achievements and the future of this joint enterprise, we should not forget the enormous investment of energy and other resources it represents. Moreover, if we wish to maintain its viability, we must continue to support it wisely and prudently.

For today we do face a crisis the outcome of which may profoundly influence your practice of medicine. To some degree it is a money crisis: all schools face financial problems in meeting heavier responsibilities at the same time as Federal funds are reduced because of the strain of Vietnam and the growing threat of inflation. No one who has watched these problems worsen in recent years could fail to be alarmed.

But to be quite candid, there are strains other than financial. In 1965 I gave a commencement address at the University of Arkansas

entitled "To Turn a Corner." And the succeeding years, while you seniors have been in medical school, have surely been filled with more tumult and division in medicine that one could have predicted even then. It is tempting to suggest that the main problems are peripheral to the primary goals of medical institutions and supporting agencies. But the medical schools and NIH are strongly influenced by three partially external universes, each itself at the vortex of pressures for change. First, the universe of education generally. Second, the whole field of science, including physical, biological and social sciences. And third, the field of health services.

The problems in education generally, and especially higher education, are the main theme of most commencement addresses this year. The issues are complex and not my subject today, though I wish to reiterate that the problems of the college campus impinge directly on the medical schools of the Nation. May I also express my personal belief that no nation, in the final analysis, can or will turn against its youth.

With respect to science generally, we see a growing impatience, hear accusations of dilettantism and lack of relevance to a wide range of urgent social problems. We are pressed to shape our research programs toward short-term practical goals, or to discontinue them altogether, on the assumption that the meager resources so released will alleviate the societal problems.

All of this comes at a particularly bad time for biomedical science. As I have said before, the present should be a time for optimal, not severely limited, investment of resources in research. Ten to twenty years ago the venture capital was available and we committed it to research. Today we have the proof that significant progress can be

made in genetics, atherosclerosis, virus cancer, dental caries, and many other areas.

Finally, with respect to health services, the Federal Government and the schools are in the throes of developing new medical delivery systems, with great pressure to meet the health needs of the underprivileged. In a period of budget constraint, in the din of rebellion and turmoil, we must beware of the forces that divide. We cannot buy more with less. We cannot insure better health by attempts, however well-motivated, to minister without requisite knowledge and skill. In short, we cannot substitute compassion for competence.

As medicine becomes more complex in the years ahead, the questions I have touched on here will become more urgent. For those of you who are entering medicine, let me remind you again of my theme of the interdependence of NIH and the medical schools. And let us remember Benjamin Franklin's words at the signing of the Declaration of Independence: "We must all hang together or assuredly we shall all hang separately." For we are faced with greater demands than ever before to deliver high-quality medicine to more people in a complex world, with strongly competing societal needs. We can only hope to meet those demands through understanding and respect for each other's goals and methods, strengths and deficiencies.

Further progress will continue to depend largely on the stability of the relationship between government and academia in the health area. The scientific excellence growing from this unique relationship has made the United States a world leader in the health sciences. More importantly, it offers, if wisely exploited, almost unlimited future benefits for all mankind.

OUTLINE
Goldthorpe, Carrigan
5/29/69

SCIENCE AND SERVICE: THE ROLE OF NIH AND THE MEDICAL SCHOOL*

Robert Q. Marston, M.D.**

I. Public expectations concerning health.

A. Lou Harris Survey findings:

1. Economic apprehensions.

2. Shortage of available doctors.

3. Public confidence in doctors.

4. Belief in high quality, science-based health care.

II. Coronary artery disease.

A. Nature of problem.

1. One million cardiovascular deaths each year in U.S.

2. 270,000 premature C.V. deaths (those under 65).

3. 170,000 of these deaths due to coronary artery disease alone.

4. Male mortality from coronary artery disease in those under 65 is three times that among women same age.

B. Main causative factors.

1. Elevated blood lipids.

2. High blood pressure.

3. Smoking.

C. Approach to problem of elevated blood lipids.

1. Development of simple tests separating high-lipid levels into 5 groups correlating with clinical patterns.

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*Commencement Address, Albany Medical College of Union University, Albany, N.Y., May 31, 1969.

**Director, National Institutes of Health, U. S. Department of Health, Education, and Welfare.

2. Evaluation of tests in general practice.

3. Need for definitive study: 30 to 50,000 participants, 5 years, $30 million a year.

III. Dental disease.

A. Nature of problem.

1. Affects 98 percent of Americans, takes over half of dentists' time.

2. Afflicts 50 percent of children under two.

3. Forces the military in Vietnam to pull 1 out of every 8 men out of combat for up to 5 days.

B. Approach to solutions.

1. Fluoridation reduces caries in children 65 percent.

2. Caries Task Force to investigate research proposals for--

a. Substituting other sugars for decay-causing sucrose.

b. Use of phosphate as food additives.

c. Use of antibiotics against plaque formation.

d. Developing new topical fluoride treatments.

e. Sealing of occulusal surfaces.

f. Use of enzyme dextranase to dissolve plaque.

IV. Federal Government-medical school relationships.

A. NIH: growth and functions.

1. Early achievements;

a. Diagnosis of bubonic plague in San Francisco.

b. Development of standards for biologic products;

c. Demonstration of pellagra as dietary deficiency disease;

d. Discovery of cause and prevention of Rocky Mountain spotted fever.

2. Legislative landmarks:

    a. National Cancer Act of 1938.

    b. Public Health Service Act of 1944.

    c. Various laws creating categorical institutes of NIH in late 1940's.

3. Present mission of NIH covers 4 fields:

    a. Research,

    b. Research training,

    c. Education in health professions, and

    d. Biomedical communications.

B. The Modern Medical School.

1. Reforms promulgated by Flexner Report.

2. Development of modern medical centers.

3. Strengthening of medical education.

    a. Ninty percent of schools affiliated with a university.

    b. Full-time faculties.

4. Federal aid to medical education.

    a. By 1950 medical schools accounted for more than half of all NIH research grants, which totalled $15 million. Last year 6300 grants amounting to $317 million went to medical schools for research--still about half of all our research grant funds.

    b. NIH funds support 24,000 individuals for advanced training.

    c. 32,000 receive scholarships or grants and 29,000 get student loans for development of health manpower and allied professions,

    d. In F. Y. 1969 NIH programs will award--

        (1) $323 million for research and educational construction and general institutional support.

        (2) Also $113 million for clinical research centers, medical libraries, and other special resources.

5. Present Crisis.

    a. Fiscal constraints.

    b. Relevance to social problems.

    c. New medical delivery systems.

6. Major influences upon the individual career.

    a. New knowledge.

    b. Nature of our medical schools.

TAB 23

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#595

Science and Service: Medical Education at the Crossroads

Robert Q. Marston, M.D., and Marjorie P. Wilson, M.D.

MEMBERS of the graduating class, ladies and gentlemen: I am very pleased to be here as you graduates enter formally into the profession of medicine. Your receipt of the M.D. degree from this great university admits you to an ancient and honorable profession which has always been concerned with the most difficult problems of mankind. Despite progress over the centuries, few would deny that you enter medicine at a time when more is expected of you than ever before as you seek to contribute to the quality of life of your fellow man.

Dean Hubbard and I have worked together for many years on the problems you will now engage—how best to meet the expanding needs and expectations of society for better health. Dean Hubbard was particularly sensitive to these issues when he served as President of the Association of American Medical Colleges. Both he and Dean Gronvall will understand why I have chosen as my theme today "Science and Service" and would like to focus on "Medical Education at the Crossroads."

In a rather literal sense, medical education is the focal point of our aspirations for improving the health of our people. It is a juncture where many complex elements, notably research, education, and service, merge and must accommodate to one another. On the other hand, medical education and its institutions are at the crossroads for the future, and some would say that survival of medical education as we know it today is being challenged.

But I do not speak to you with despair. On the contrary, I am increasingly optimistic that we can meet the essential health needs of the nation. I base my faith in part on the ability of our profession to attract the kind of talent and devotion represented by this graduating class. I am also supported by the conviction that we have been uniquely successful in creating a revolution in biology which has only begun to make itself felt in medicine. Finally, I am keenly aware that this country is increasingly committed to seeking better health for all. My basic optimism, however, does not blind me to the fact that we face formidable problems in medicine in the years ahead. Some of the most difficult will relate to medical education and the supply of health manpower.

Medical education in the United States is viewed as being the best the world has ever known, and at the same time, so deficient as to require radical overhaul. Some say the schools are affluent, others that they are bankrupt. There is no difficulty in obtaining various views concerning medical education. A growing literature is available, many distinguished and representative committees and commissions have issued valuable reports, and almost all medical schools in the last decade have undergone searching examination of goals and purposes. Yet there is an overwhelming temptation to seek simplistic answers.

In a recent lecture dealing with the tasks of renewal in today's society, John W. Gardner[1] posed the dilemma in this way:

> When we believed that the king or the courthouse gang were in charge, at least we weren't puzzled. Perhaps the most frustrating thing of all is not to know whom to blame. Given that puzzling question, two opposing hypotheses emerge. One is essentially paranoid and says, "Evil people with evil purposes are running things behind the scenes." This is the view of the far right and the far left . . . . The other hypothesis is that perhaps no one is in charge—and that may be the most frustrating conclusion of all . . . .
>
> Is there any way for the large, highly organized modern society, whatever its ideology, to avoid the beehive model? The honest answer has to be "Perhaps." There is a possible path to salvation—not easy, not uncomplicated, but identifiable. There are a great many things we can do to redesign large-scale organization so that it is a hospitable environment for the individual. And there are many things we can do to tone up our tradition of individual freedom so that it can survive in the modern world.

When we consider "medical education at the crossroads," several things come to mind: the manpower crisis; the blending of research, education, and service activities; and special problems of various types of schools—ranging from the less affluent schools where basic existence is threatened, as one example, to those relatively few institutions, predominantly private (although The University of Michigan is a striking example of a public institution included in this group), which are training the majority of the future medical school faculty members.

Research

We are aware that certain changes in our system for supporting medical research are desirable and inevitable. The type of hard question we ask ourselves is: What should the balance be among investigator-initiated project research, institutional support, and

Based on a commencement address at the University of Michigan Medical School, Ann Arbor, June 6, 1969.

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targeted research and development? If changes are introduced too abruptly, however, the results could be highly destructive. For example, a mass exodus of highly trained medical scholars from the university to private medical practice as a result of a precipitous decline in overall research support would only modestly increase the number of practicing physicians, but would make it impossible to maintain a full time, high quality clinical faculty for teaching, research, and clinical care in many medical schools.

This would have an immediate and devastating impact on medical education. The loss of quality suffered over time would be incalculable, as promising young men would turn away from academic careers with only small hope of competing for support for their research interests. The strength of the national academic "system" for teaching and research would be undermined and only recovered over a long period and at much greater cost—and it is inevitable that it would have to be reestablished. Thus, contemplated change in the level or pattern of Federal support for biomedical research needs careful analysis of the potential immediate and long-range effects for both harm and benefit.

Biomedical research has found a natural focus in academic institutions, particularly medical schools, to a far greater extent than has research in any other area of science. This is reflected in the unique relationship which has developed over the past 20 years between the universities and the National Institutes of Health. Moreover, research in these institutions has become interwoven with the related responsibilities for teaching and service. Trends which will impact on these institutions are the serious curtailment of funds for research without adequate offset from other sources, greater emphasis on targeted research than on fundamental research, and the growing climate of anti-research which may be part of the general anti-intellectualism so conspicuous today.

Dr. Lee DuBridge,[2] Science Advisor to the President and Director of the Office of Science and Technology, eloquently expressed his philosophy recently on the importance of science, in testimony before the Subcommittee on Science, Research and Development of the House Committee on Science and Astronautics, re: H.R. 35, February 19, 1969:

> We as a nation are confused and troubled on many fronts and on many issues. We are troubled by a costly war in a far distant land. We are troubled by our less than cordial relations with many other nations and peoples on this tiny planet.... We are distressed by the troubles in our cities, about the unhappy relations between black and white Americans, about the breakdown of the peaceful and scholarly atmospheres in our schools and colleges. We are distressed by air pollution, water pollution, about the disaster to the Santa Barbara beaches, about noise and traffic on our streets and in the air....
>
> So it is not surprising, in these troubled times, that many people ask: What is science doing for us? Isn't it true that science and technology are the cause of many of our troubles? Can't we devote our energies and our money to more urgent problems? ...
>
> Is it that we have too much knowledge and have developed too much skill in using it? Certainly not!
>
> We are only beginning in our search for knowledge. We are still groping to find more effective and more thoughtful and considerate ways of using it.
>
> We often think that new technological devices or new social inventions spring suddenly from the minds of a great inventor or from a massive new effort. But in every case the inventor had built upon a vast base of fundamental knowledge that had grown out of the basic research endeavors of previous generations of scholars.... Radio, television, the automobile, the airplane and all the other marvels of modern technology similarly stem from the results of basic research in physics and chemistry which long antedated these apparently "new" inventions. Similarly our modern methods of curing many diseases and alleviating much human suffering were made possible by the work of physicists, chemists, biochemists and biologists stretching back 50 to 100 years.

DuBridge's thesis is that in many ways our human ideals and goals have moved ahead faster than our physical and intellectual abilities to achieve them, and that we must continue to press for greater scientific understanding and technological capability.

President Nixon's[3] comments concerning science and its future role are also particularly applicable to biomedical research:

> Science has served mankind faithfully and well. It has dramatically extended the average lifetime, shortened geographical distances, increased industrial productivity, reduced poverty, and ... contributed significantly to the cause of freedom.... If science and technology were to flounder or stagnate, many of our hopes would collapse. To the extent that we neglect the source of our greatness, and to the extent that we fail to preserve the conditions of openness and order that made our progress possible, we are living off the land of civilization without refertilizing it....

Biomedical research has come a long way since the problems of World War II provided the initial impetus for the commitment to support science. In the quarter century an extraordinary network of talented investigators and research-oriented institutions of excellence has been created in the United States. A detailed recital of the research accomplishments is beyond the scope of this address. Suffice it to say that the expansion of knowledge and understanding of the biological and medical sciences has by far exceeded expectations, has probably eclipsed the rate of advancement of any other field of science during the same period, and has given rise to the conviction within the scientific and technical community that the world is on the threshold of the "Age of Biology."

The programs supported by NIH are generally recognized as mission-oriented, in the sense that the scientific research supported under them is directed at the acquisition of new knowledge, not as an end in itself but primarily as a means to solve health

problems. The great bulk of this work—over 90 percent—has been carried out in nongovernmental institutions. The allocation of resources for research has been influenced to a considerable degree by a broad array of consultants from outside of government, numbering at the present time more than 2,000, who have participated in the selection process with us. This remarkable "research system" reached full development as recently as five or six years ago, taking actually two decades to build.

As I visit the various Institutes at NIH and review their programs, I see concrete evidence of health gains made possible by "venture capital" invested in research in the last 20 years. Work conducted throughout the nation enables our scientists to speak confidently, for example, of developing the capability for controlling dental caries, of significantly reducing the problem of premature deaths from coronary artery disease in the American male, of truly major breakthroughs in the understanding of cancer, and of practical applications of knowledge in genetics to the care of patients.

Perhaps even more important, I hear of substantial progress in fundamental research. The decoding of the nucleic acids, the synthesis of an enzyme, the work on a microscope so powerful it can photograph a single molecule, and developments pointing to major advances in the behavioral sciences—these are some of the areas that offer exciting promise in basic research. And although I have been hearing these things all my life as a scientist, there is a difference today—a difference I can ascribe only to the fact that we seem to be approaching a critical period in biological research, a period such as the physical sciences passed through several decades ago with the acquisition of a critical mass of knowledge, a pool of highly trained investigators, and sophisticated research techniques. All this suggests that we can look with optimism toward the development in the near future of general theories of life and disease. I find this very real and very relevant to the needs and aspirations of the human race. Indeed, expansion of the knowledge base of medicine will determine, more than any other factor, our ability to improve the health of old and young, rich and poor.

Education

The core function of an academic institution is the education of its students. The concern of the medical schools with this function is reflected in curriculum changes reported by many schools at last fall's AAMC seminar on the medical curriculum. A series of milestone reports over the past decade have articulated with almost a single voice the need for a greater number of physicians, and in the past year the medical schools have begun to respond to this quantitative need for change. The most striking evidence of our national need is that last year the number of foreign medical graduates entering the United States exceeded our own graduates. The number of foreign medical graduates entering the country annually has increased from just over 5,700 in 1962 to 8,000 last year, as compared with an average domestic graduation of about 8,000.

Many believe that the richest nation in the world can and should do much more to produce the medical manpower it needs, and that this can be accomplished while at the same time maintaining and improving the quality and relevance of medical education. The climate for action and the sense of urgency are clearly visible. Fifty percent of poor children still do not have adequate immunization, and 64 percent of poor children have never seen a dentist. Forty-five percent of women who have babies in public hospitals have not had prenatal care. An infant born to poor parents has twice the risk of dying before his first birthday than a child from a non-poor family. These problems, of course, will not be remedied by increased numbers alone; the substance and organization of the delivery of health services in the future will have to be different. But the solution through the institution of new service patterns is undoubtedly some time away. In the years immediately ahead, population growth, increased income, and high educational levels mean greater general demands for medical and dental services, further burdening the woefully inadequate services to the poor.

With the passage of health manpower legislation, beginning in 1963, there are now Federal funds for support of medical education. This comes at a time when there is a general awareness of the needs for additional manpower—a deficit sharply emphasized, as I have said, by the fact that we are importing many physicians from less fortunate nations to supplement those graduated from our own medical schools. To meet these urgent needs, there is a greater disposition to apply at least some of the resources required and a firm commitment to make the necessary changes in the educational system.

Fortunately, this comes after a decade of experimentation in medical education and at a time when our institutions are intellectually wealthy, though in some cases financially impoverished. Thus the stage seems unusually well prepared for a major move forward. Yet a certain hesitancy is clearly evident. All agree that numbers alone will not solve our health problems—that special attention must be given to unmet health needs, as in the ghettos and isolated rural areas. There is also a maldistribution among various specialties of medicine, and curricula must advance with the times. There is an understandable reluctance to "fix" the present educational system at

a time of some uncertainty about the form of the delivery systems. Many want a more coherent strategy—Federal, state and institutional—which will assure that manpower resources needed to improve health services will indeed be effective.

Educational institutions are at the crossroads on the manpower issue because their students, their communities, their facilities, their deans and presidents, their alumni, their public officials are alarmed about manpower shortages—numbers, distribution, types of health personnel. Medical schools now have the moral support, motivation, and competence to respond to manpower needs. But here, as in the case of the biological revolution, financial constraints due to inflation and war complicate the picture.

Service

In the area of service, the problems of educational institutions relate largely to the unresolved problems of health services generally—problems of cost, of distribution, of responsibility without the commitment of adequate resources. Medical schools do belong in the medical service business just as they belong in the research business. But just as they are not simply research institutes, neither are they simply community hospitals. They are complex enterprises carrying out multiple missions.

Institutions for medical education have a major but shared responsibility in the area of health services, if only because exemplary health care is a part of the educational process and because educational institutions are the only available reservoir for certain types of talent and capability.

Whatever else happens in the organization and delivery of health services in this country, it seems clear that some degree of regionalization involving the sharing of responsibilities and resources will come to pass. Research in the organization and delivery of services will increase, and will require model programs, often involving special populations such as the disadvantaged. The highly trained residents and graduates who have been going out to practice in recent years will serve as major bridges between academia and other practitioners.

To return to the theme of my address—medical education at the crossroads—let me reiterate that the expectations of the American people concerning health services are very high. They expect them to be science-based and generally available, whether the services concern environmental control, preventive medicine, curative medicine, or rehabilitative care. They clearly expect miracles and they expect them in quantity. Their expectations so outstrip our ability to deliver that all of us in the health field can anticipate unfair criticism at times and pressures from many directions.

It is important that we do not underestimate the seriousness and extent of these expectations. A recent Lou Harris[4] survey indicated that concern for health, while greatest among the poor, affects our population at large. Let me quote a few sentences from this report: "The economic apprehensions over health are abiding and deep. They may be far more acute for the poor, but for somewhere over one family in every three of the country, they are serious." Another observation was phrased thus: "A major cry emerging from the American people today is over the shortage of available doctors." And a final quote: "In its own pragmatic way the American public usually solves its problems by letting them get worse before they get better. In the case of health, there are many signs that the situation is widely believed to have become worse."

The Crossroads

All these expectations come at a time when there is strong and serious competition for resources. As recently as two years ago we still talked about this affluent country's ability to attack the problems of the cities, of the universities, of health, along with carrying our Vietnam commitments. Today we know that even when the war in Vietnam is over, the pressing problems that clamor for attention will far exceed our available resources, human and financial. Health will probably fare well in this competition for funds because it is relatively easy to understand and concerns all people. But we must be scrupulously honest and forthright in pleading our case. Because it is, by and large, a good case, we are willing to undergo the same type of scrutiny required in any other field: cost effectiveness, priorities, and marginal benefits. I realize these are cold and unwelcome words in a profession concerned with the healing arts. But we are no longer immune from such questions.

I think we should also recognize that over the next few years, strong divisive forces will be seeking tradeoffs among research, education, and service—seeking shortcuts where the short-term goal takes precedence over requisites for the future; where the substantive base for improving health is less persuasive than the well intended assertion. A simple comparison of the nation's $2.5 billion expenditure for medical research last year with its $53 billion in total health costs illustrates, I think, the folly of sacrificing to short-term goals! But you will recall that I said I was encouraged and generally optimistic. I see this nation as having a unique opportunity to contribute to the health and welfare of all mankind. And I think that you who are graduating today will agree with me on that point.

Despite John Gardner's[5] well founded concern that even excellent institutions, run by excellent

human beings, are inherently sluggish, indifferent to innovation, slow to respond to human need, and not eager to reshape themselves to meet the challenge of the times, the academic institution is potentially the most effective instrument for change in medicine. An equally and uniquely powerful force is the young physician himself. At the crossroads, these "instruments for change" can determine the course to be followed in the future.

In responding to intense pressures to participate in the solution of urgent social problems, the medical school must not abandon its traditional responsibility for scholarship, inquiry, and criticism, and it must maintain sufficient aloofness or objectivity to continue to function in these areas. It must apply the same spirit of inquiry and evaluation, the same standards of quality, to community health services which it may eagerly—or reluctantly—undertake to provide. It must hardheadedly recognize its limitations, but also its strengths, as well as its potential as an instrument for change in the delivery of health services in the future.

The contribution to research in the delivery of health services can be as great as it has been in fundamental biology—but it must be equally distinguished. To undertake these expanded functions, as well as obligations for educating more doctors, updating the curriculum, and continuing to increase the scientific and technological base for medicine, the medical schools will have to become more efficiently operated institutions—with better machinery for getting things done and much less waste motion than could be afforded in the past.

More emphasis on ambulatory care will improve many aspects of care and will help with problems of cost. Establishing access to care in the community holds promise and has been suggested repeatedly—perhaps most forthrightly in the study[6] on the costs of medical care in 1932! A recent article in the *New England Journal of Medicine*[7] places the modern concept of the neighborhood health center in historical perspective and discusses the inherent problems which have been encountered along the way since the health center movement began in 1910-15. There are no easy answers, but we are still hopeful.

The Federal Government must also take a hard look at the national goals for health which have been set forth, and its commitment toward providing assistance in achieving them. For example, to what extent should we subsidize medical schools? The present level of medical school expenditures attributable to the Federal government is 52 percent. We are one of the few developed nations of the world which does not provide a full subsidy for medical education. There are equally hard questions related to Federal underwriting of the cost of medical care which, by comparison, may make those related to the level of research support seem simple.

It has been said that many of the health problems of the poor in our country relate more to sociological needs than to medical needs—and that poverty, undereducation, and poor living conditions must be remedied or good health care will be in vain. Some of the problems of bringing health care to the disadvantaged are part of the "sociology of medicine." Why is it so difficult to provide the necessary preventive and curative services? First of all, the appropriate institutional forms for providing the service must be built—if not from a bricks and mortar standpoint, then from a conceptual standpoint—and most importantly, the people, particularly the physicians, must be there to work. What kinds of incentives are necessary to entice, encourage, inspire our physicians to go where they are most needed? The young corps of graduating physicians can help us with this. Our present group of students is more responsive to human needs and more sensitive to the social crises in our country than any previous group, or at least they are more vocal about it.

Whether we face a real or a pseudo crisis in health care, it is predictable that our traditional patterns will change. Our academic institutions can select the road that leads to the understanding and demonstration of what can work, and the young physicians of the future are the ultimate instruments for effecting the transformation. There may be sacrifices ahead for all of us in medicine, but particularly the young physicians caught up most intimately in the changing times. What are you willing to do? In a sense, you are even now an unorganized voluntary corps!

May I say in closing that it makes a difference who says such things. I am expected to say them because it is my business, and thus inevitably such statements are taken for granted. But for you who are now entering your chosen profession and seeking to advance the cause of health, there is a clear obligation to understand the forces now shaping medicine, to interpret them to your community, and to use your idealism constructively and creatively.

Medical education and its institutions are in truth at the crossroads in 1969. Ten years from now The University of Michigan will be different from the institution you leave today, and its graduating class will be different from yours. Your job and mine is to be sure it is better, not worse, that it is still a source of new knowledge for the world, that its teaching is both excellent and relevant, and that its service contributes to the broader field of health care.

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TAB 24

BIOLOGICAL SCIENCE AND THE FUTURE OF MAN*

Robert Q. Marston, M.D.**

The twentieth annual meeting of the Tissue Culture Association is an occasion of particular significance, and I am most grateful for the opportunity to meet with you and speak briefly on some topics of mutual interest.

One reason that your meeting is significant is that it marks the coming of age of a remarkably fruitful technique--a technique that has grown into a scientific discipline of widespread application and enormous potential. Eloquent testimony to its value is seen in the growth of the Association itself--from its 21 founders to a membership approaching 2000 from 16 nations. To those founders, many of whom are present today, I should like to offer a special word of congratulations on the truth of your vision and the success of your efforts.

Four who are not present--Drs. Wilton Earle, Warren Lewis, Charles Pomerat and Philip White--are with us in spirit. They would have wanted nothing more than to witness this manifestation of the importance of their work, both to biological science and to medical practice.

The occasion is also highly significant in point of time. For it constitutes a reaffirmation of the vital and prolific role of basic

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science at a time when the social relevance of such endeavor is widely challenged--so much so, in fact, that a major threat to our hopes of improving the health of the American people is the anti-research climate of the day.

It will be my purpose tonight to view tissue culture from the standpoint of a Federal science administrator whose business it is to recognize and foster research applicable to many health missions. I will try to express certain convictions as to the role of basic, or discipline-oriented, research in mission-oriented programs. And I will draw on examples of recent advances against three health problems to illustrate how productive the technique of tissue culture is proving to be.

The mission-oriented programs of the National Institutes of Health exist to improve the health of people through research, education and communications. The most important avenue to this goal is through the development of new knowledge of basic life processes. To assert this principle in the last third of the Twentieth Century may seem unnecessary, for it has long been recognized. We hear, for instance, the chemist John William Draper, writing a century ago--and long before the era of "big science"--as he points to both the abstract and practical fruits of research:

> The scientific study of Nature [he said] tends not only to correct and enoble the intellectual conceptions of man; it serves also to ameliorate his physical condition.

Yet there does seem to be need today for an assertion of the value of basic science amid the pressures upon institutions to eschew

dilettantism and get on with the solving of "real" problems. In such an atmosphere, we must examine the commitment to basic science which is implicit in our national health effort.

Although our country's early history does not show a consensus as to the Government's role in science, the Federal commitment has been promulgated in both law and tradition. Most early science programs were created in response to national crises, and many have come down to us as vestiges of those emergency operations. One example was the Army Medical Library, which emerged from the Civil War and became in recent years the National Library of Medicine.

The research component of the National Institutes of Health originated in 1887 as a small biological laboratory on Staten Island, New York. It was established out of concern for the threat to public health of the great waves of immigration at that time. Its founder, Joseph Kinyoun, was the first to detect cholera organisms in persons entering the country.

World War I brought a host of science agencies, but few long survived the armistice. They included the National Research Council and small research activities within disease control programs of the Public Health Service.

After the national emergency of World War II, there was a change in the pattern. Hiroshima and the advent of antibiotics had effectively demonstrated what science and technology could do, and the Federal Government assumed responsibility for its continued support. This is attributable in no small measure to the advice of Vannevar Bush in Science, the Endless Frontier, urging the President to retain the contractual arrangements with universities and other private laboratories

which could be turned to peacetime use. One result of lasting importance was that NIH continued to support under its general grants program the biomedical studies that had been sponsored by the wartime Office of Scientific Research and Development.

Moreover, the pattern of NIH support of research in major disease categories, begun under the National Cancer Act of 1937, was extended shortly after the war to include many important health problems. In addition to aiding research, the several new Institutes established by the Congress--Heart, Dental, Neurology, Arthritis and Metabolic Diseases, Allergy and Infectious Diseases, Child Health, General Medical Sciences, and the new Environmental Health Sciences and Eye Institutes--were authorized to make awards for research training. Thus NIH grew in statutory responsibility as well as the magnitude of its supportive operations, and was charged with broad responsibilities for the future.

The Federal Government now supports two thirds of the Nation's $2.6 billion effort in biomedical research. And NIH accounts for a little over half of the Federal contribution, predominantly in the form of grants to nonprofit, non-Federal institutions.

Of all NIH funds for research, education, and the National Library of Medicine, an estimated 20 percent this fiscal year will support non-Federal training of scientists and health professionals, while 30 percent will aid research and educational construction, special resources, and the general institutional environment. The largest part, 47 percent, will support research projects.

In general, the new pattern of Federal operation in science which has evolved since World War II is one of broad support of research and

development, mainly through mission-oriented programs. In health-related research, a greater proportion of the Nation's total effort depends upon Federal sources than in other areas--say, medical education or service. For example, about 80 percent of sponsored research in medical schools derives from the Federal Government, as compared with only 50 percent of the schools' total expenditures. All in all, the nature and dimensions of the Federal science enterprise imply a major, long-term commitment to the scientific and medical communities--a commitment

- To sustain the total apparatus of research and training that have been created at great effort and cost.

- To meet the special needs that can now be anticipated, such as rising costs from both inflation and the growing sophistication of science.

- And to exploit the new research opportunities that emerge.

The pressing social problems of today--the problems of the cities, of health, of the universities, and of race--are so urgent that there is a special need to articulate clearly the nature and relevance of basic science. Those in this room will agree readily to the following assertions:

- That much valuable new knowledge arises through basic research--through studies designed to advance frontiers in the scientific disciplines.

- That progress toward social goals, even through mission-oriented programs, depends heavily upon the freedom of the investigator to pursue his discipline-oriented studies.

- And that the conquest of major diseases will require long-term programs in which the basic pool of knowledge is at present inadequate and must be constantly replenished.

As I say, we agree--but others are raising serious questions concerning just these points. In discussing the issues, I have found two diagrams useful. These are adapted from TRACES--"Technology in Retrospect and Critical Events in Science"--a study conducted for NSF by the Illinois Institute of Technology Research Institute. They illustrate well, I think, the relationship of basic, applied and developmental research in the overall process that eventually leads to technological innovations.

The first chart [1] represents the evolution of the electron microscope. Without attempting to follow this in detail, we see how nonmission research, paramount in the initial stages (red dots), becomes mixed with mission-oriented research (blue triangles), and finally leads to development and application (green squares).

The next chart [2] shows the evolution of oral contraceptives, using the same symbols.

But some of our best examples can be seen in your own fields. Thus, I have asked for help from several NIH scientists in examining some current research projects involving tissue culture. These examples, I think, represent dramatically the splendid opportunities that have been

opened in mission-oriented programs through use of a technique owing much to basic investigation.

We find in the field of cancer some of the first applications of tissue culture to a health problem. These early efforts are typical of the process by which a technique is developed in the course of its application, the practical problem defining to some extent the directions of the basic research. For instance, it was early recognized in attempts to study carcinogenesis *in vitro* that certain technical advances would be desirable or necessary:

- Larger cultures,
- Chemically defined media,
- Pure cell lines.

In what ways, I have asked our scientists, has success in these objectives been paying off?

You will recall that Gey at the Johns Hopkins Hospital (1941) and Earle at the National Cancer Institutes (1943) had shown that normal cells from rodents, after a period of growth in tissue culture, give rise to tumors when reimplanted into animals. Subsequent work by these and other investigators demonstrated that spontaneous neoplastic transformation is a reproducible phenomenon occurring in cells from many tissues and species.

In 1966 investigators at NCI, taking advantage of ample cultures and chemically defined media, observed that certain types of serum used in the medium can delay or possibly prevent this phenomenon. Tumors were obtained from cells grown on a medium containing horse serum but not from

those grown on fetal calf serum. In the search for an explanation of this remarkable finding, the following observations have been made:

- That irregularities in chromosome number and morphology precede the appearance of neoplasia.
- That there are fewer structural alterations in the chromosomes of cells in fetal calf serum than in horse serum.
- That horse serum, in fact, seems to induce chromosomal breakage.
- That profound morphologic and metabolic adaptations are associated with the neoplastic transformation, including the emergence of a new cell type.
- That a cell line of neoplastic tissue cultures _in vitro_ had a high RNA methylating capacity, a result consistent with the hypothesis that aberrant methylation may be requisite to some types of neoplasia.
- And that previously unsuspected viruses are demonstrable in some cultures.

But now, if I may, I shall leave this very promising frontier and move on to another.

Modern virology and vaccine development are indebted to tissue culture through the work, originally, of Enders, Weller and Robbins. Their classic observation in 1949 that polio viruses would grow in cell cultures derived from nonnervous tissues led, of course, to the development of polio vaccines.

The revolution in virology, however, stemmed from their observation that virus growth in cell cultures could be detected by a superficial microscopic examination for cytopathic effect. This provided the virologist with the simple tools needed to search for so-called "new" viruses and to study "old" viruses.

The cultivation of polio virus in tissue culture revealed a way to work with the viruses of such common childhood diseases as measles, varicella and rubella. More startling was the recovery of scores of unexpected agents: adenoviruses, rhinoviruses, parainfluenza viruses, echoviruses, reoviruses and others. This opportunity to cultivate many viruses old and new launched two decades of unparalleled progress in virology and vaccine development.

With respect to the interrelationship of basic and applied research, some points might be made about the initial events. The work of Enders _et_. _al_. was basic research in that they were interested in the general effects of viruses on cells in culture. While this is an example of the push that tissue culture gave virology, the reverse is equally true. The great step in virology created a demand for tissue culture know-how, reagents and equipment. So in a very real way, tissue culture development in the past two decades has ridden the crest of the surge in virology; and of course, many other fields--oncology, physiology, genetics, etc.--have been enriched in the process.

In at least one area of virology--vaccine development--we are largely in an applied research phase intimately dependent upon cell culture methods. One of these areas of targeted research has just delivered another vaccine to control human disease. I refer to live rubella virus vaccine, which our Division of Biologics Standards licensed for general use only yesterday.

Rubella vaccine is in every sense a child of tissue culture, and owes its development not only to the virologists but also to the investigators who for many decades sought the successful propagation of cells _in vitro_.

Many stages of the vaccine's development depended on the tissue culture technique. The virus was first isolated in 1962 using tissue culture methods. These were again instrumental in characterizing the agent as an RNA virus approximately 50 mu in size, and in defining its biological properties. During the rubella epidemic of 1964, with its toll of 50,000 defective pregnancies, the availability of specific diagnostic techniques--involving tissue cultures--enabled physicians to delineate the pathology of maternal-fetal rubella. And these same tools were used by scientists at NIH in working out the hemagglutination-inhibition, or HI, test for rubella immunity, which has been used to gather the epidemiologic data now vital as we begin the control of the disease.

The virus was attenuated by serial passage in cell cultures, and its attenuation was detected and measured by still other culture methods. Now the pharmaceutical industry is mass producing the live vaccine in tissue cultures, once again drawing upon the experience you in this audience have gained over the years.

Tissue culture techniques have also been at the heart of some of the most interesting recent developments in our knowledge of human hereditary diseases. We are just now gaining a glimpse of the potential value that can accrue to both clinical medicine and basic biology through use of this viable bridge between the two areas.

An ever-increasing number of biochemical mutations associated with human hereditary diseases are being found. Many are enzyme defects that are expressed in fibroblasts cultured from simple skin biopsies. With this approach a much more detailed study can be made of the biochemical consequences of the mutation than would be possible with tissues available directly from patients.

From the economic standpoint, the approach is especially attractive in that is does not require the continued presence of the patient in an expensive hospital bed. Moreover, it greatly extends the range of patient material that can be studied, since the patient's physician even in a remote area can obtain the skin biopsies and mail them in culture media to the investigator. Further economy is provided by the ability to freeze the cells, store them for extended periods, and revive them long after the patient's departure from the clinic. Even his death does not necessarily terminate the investigation, for viable fibroblasts have been cultured from skin biopsies taken as long as 24 to 48 hours after clinical death of an affected person.

Through use of human fibroblasts in culture, recent studies have shown that females heterozygous for X-linked biochemical disorders show mosaicism in their somatic cells, with expression of the normal X-chromosome in some cells and the defective one in others (in accordance with the hypothesis of Mary Lyon). Such mosaicism has recently been identified at NIH in heterozygote carriers of a sex-linked, recessive neurological disease resulting from a defect in an enzyme of purine metabolism.

In the course of clinical studies under J.E. Seegmiller of our National Institute of Arthritis and Metabolic Diseases, it was learned that a maternal relative of one of our patients was pregnant. Her physician

in Vermont placed a simple skin biopsy in culture medium and sent it to NIH by mail. Dr. Seegmiller's group cultured the fibroblasts and found the two cell populations that are characteristic of the heterozygote state, confirming that the mother was indeed at risk for producing a defective child. Within twenty-four hours, she was admitted, and an obstetrician obtained a small amount of amniotic fluid (by amniocentesis). Some of the amniotic cells were stained. They revealed heterochromatin material--the "Barr bodies" characteristic of female cells--allowing our physicians to reassure the mother promptly that her baby would be a girl and thus not afflicted.

Then the rest of the amniotic cells were grown in culture. They did reveal mosaicism, indicating that the female fetus was also a carrier. They also demonstrated for the first time the biochemical capability of identifying all four of the possible genotypes for this disorder in the unborn-child around the mid-point of the pregnancy.

These studies open the way for a preventive program to control this serious and incapacitating neurological disorder. Through prenatal diagnosis and control of gestation, parents carrying such serious hereditary defects will ultimately be able to utilize their unaffected normal genes to produce the normal children they desire. The list of genetic disorders that are potentially treatable by this approach has been considerably extended since the presentation by Dr. Uhlendorf of our Division of Biologics Standards at your last year's meeting.

In another study investigators have been able to show the mutual correction of two different enzyme defects by fusion of the two human mutant fibroblast lines. This achievement gives promise of extending

to human diploid cells some of the approaches used with remarkable effectiveness in the genetic analysis of microbial systems.

Tissue culture may be expected to increase greatly our understanding of hereditary disorders. It also opens the way for participation by far more individuals than heretofore in the investigation of interesting basic aspects of clinical disease. Biologists, biochemists and others who may have had no formal training in clinical medicine can thus, if they desire, find a new type of relevance to their work.

So far, I have talked about the necessity of supporting basic science in mission-oriented programs, about the Federal commitment to basic science, and about the interrelationship of basic and applied research in the quest for new knowledge relating to health. Tissue culture, a field representing the full spectrum of research, serving on the one hand to advance many fundamental disciplines and on the other to yield practical techniques and materials to medicine, constitutes a microcosm in which all the processes of scientific development can be observed.

Now I should like to express a few thoughts relating biological science to the future of man. In a word, the future--that brave new world which civilization and aspiration seem always to promise--is largely dependent upon further progress in the biological sciences, and such progress cannot be taken for granted.

In my emphasis tonight on research, I would not minimize the other requisites to advancement in health:

- Education and biomedical communications.

- Viable private research institutions and agencies, including the universities and the pharmaceutical industry.

- Efficient health-care delivery systems.

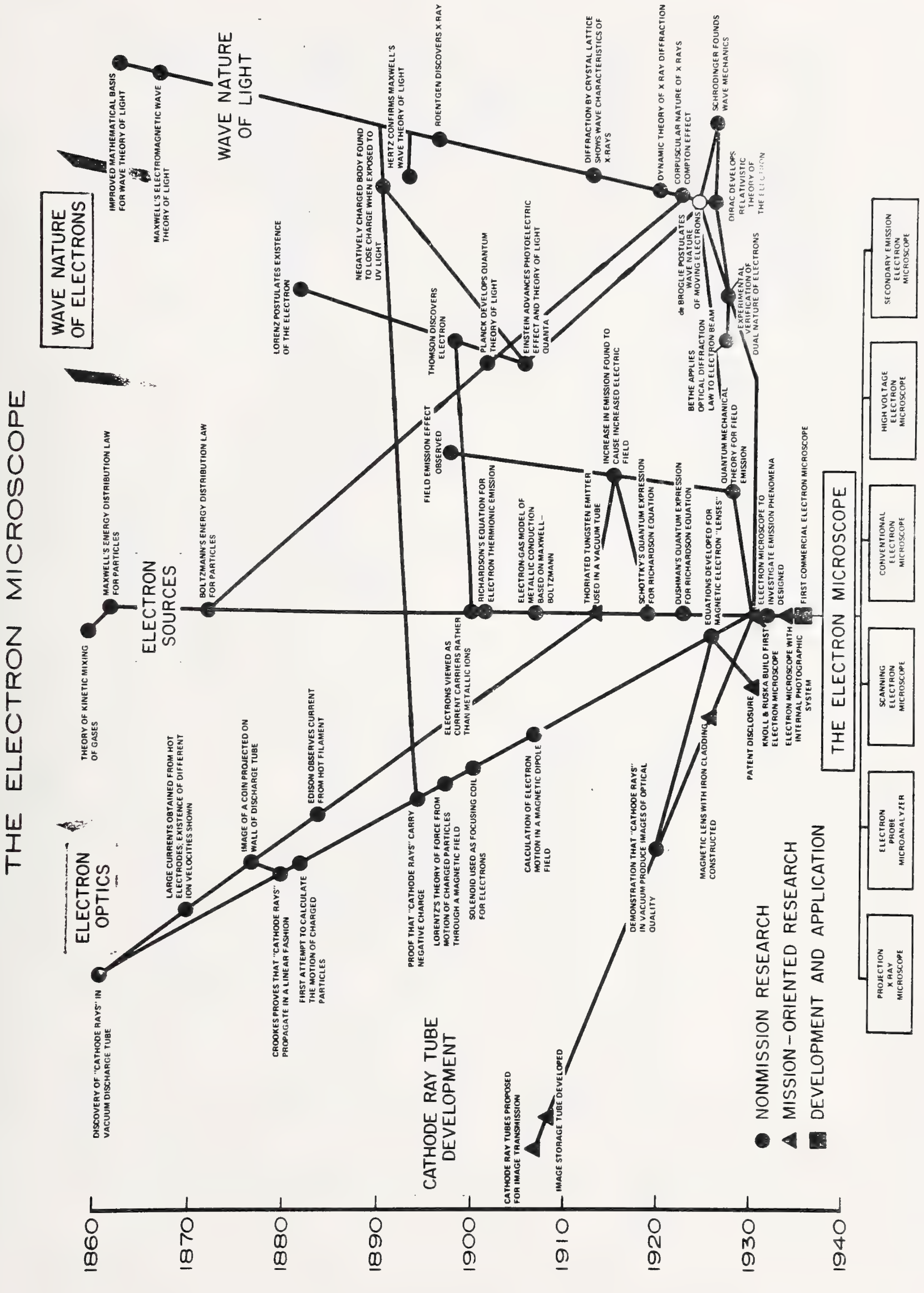
- And a population well motivated and economically able to utilize the resources available.

But the wellspring is biological science, performed in a climate of free inquiry, on a long-term basis. Broad support, taking into account the perpetuation and replenishment of programs, must sustain institutions and investigators conducting basic and applied, preclinical and clinical research, in balance. During the present period of budget constraints, the support will be less than could be wisely spent; but I see nothing on the horizon that militates against our continuing to award Federal funds on the basis of scientific excellence. The danger lies in the competition between science and other societal needs, including health services. And here we can only reiterate, loud and clear, that health services without new content derived from science offer no final answers.

The future of man will depend also on society's selection of research missions, for these in a general way influence scientific progress in all phases. A very high priority should be given to the support of basic biological science. Only in this way can we have the scientific base to approach the major problems facing the world today--overpopulation, chronic disease, congenital defects, behavioral disorders, and deterioration of man's environment.

In closing, let me pay tribute to this organization for its special contributions to young people needing assistance. You have welcomed new members, kept dues down, and established special training courses to meet the needs of a large number of fields. As in all your endeavors, the beneficiaries are the biological sciences, medicine and humanity.

[Chart 1]


THE ELECTRON MICROSCOPE
WAVE NATURE OF ELECTRONS
WAVE NATURE OF LIGHT
ELECTRON SOURCES
ELECTRON OPTICS
CATHODE RAY TUBE DEVELOPMENT
THE ELECTRON MICROSCOPE
IMPROVED MATHEMATICAL BASIS FOR WAVE THEORY OF LIGHT
MAXWELL'S ELECTROMAGNETIC WAVE THEORY OF LIGHT
NEGATIVELY CHARGED BODY FOUND TO LOSE CHARGE WHEN EXPOSED TO UV LIGHT
HERTZ CONFIRMS MAXWELL'S WAVE THEORY OF LIGHT
ROENTGEN DISCOVERS X RAY
DIFFRACTION BY CRYSTAL LATTICE SHOWS WAVE CHARACTERISTICS OF X-RAYS
DYNAMIC THEORY OF X RAY DIFFRACTION
CORPUSCULAR NATURE OF X RAYS COMPTON EFFECT
SCHRODINGER FOUNDS WAVE MECHANICS
DIRAC DEVELOPS RELATIVISTIC THEORY OF THE ELECTRON
de BROGLIE POSTULATES WAVE NATURE OF MOVING ELECTRONS
EXPERIMENTAL VERIFICATION OF DUAL NATURE OF ELECTRONS
BETHE APPLIES OPTICAL DIFFRACTION LAW TO ELECTRON BEAM
LORENZ POSTULATES EXISTENCE OF THE ELECTRON
THOMSON DISCOVERS ELECTRON
PLANCK DEVELOPS QUANTUM THEORY OF LIGHT
EINSTEIN ADVANCES PHOTOELECTRIC EFFECT AND THEORY OF LIGHT QUANTA
FIELD EMISSION EFFECT OBSERVED
INCREASE IN EMISSION FOUND TO CAUSE INCREASED ELECTRIC FIELD
QUANTUM MECHANICAL THEORY FOR FIELD EMISSION
THEORY OF KINETIC MIXING OF GASES
MAXWELL'S ENERGY DISTRIBUTION LAW FOR PARTICLES
BOLTZMANN'S ENERGY DISTRIBUTION LAW FOR PARTICLES
RICHARDSON'S EQUATION FOR ELECTRON THERMIONIC EMISSION
ELECTRON-GAS MODEL OF METALLIC CONDUCTION BASED ON MAXWELL-BOLTZMANN
THORIATED TUNGSTEN EMITTER USED IN A VACUUM TUBE
SCHOTTKY'S QUANTUM EXPRESSION FOR RICHARDSON EQUATION
DUSHMAN'S QUANTUM EXPRESSION FOR RICHARDSON EQUATION
EQUATIONS DEVELOPED FOR MAGNETIC ELECTRON "LENSES"
ELECTRON MICROSCOPE TO INVESTIGATE ELECTRON EMISSION PHENOMENA DESIGNED
FIRST COMMERCIAL ELECTRON MICROSCOPE
DISCOVERY OF "CATHODE RAYS" IN VACUUM DISCHARGE TUBE
LARGE CURRENTS OBTAINED FROM HOT ELECTRODES; EXISTENCE OF DIFFERENT ION VELOCITIES SHOWN
IMAGE OF A COIN PROJECTED ON WALL OF DISCHARGE TUBE
EDISON OBSERVES CURRENT FROM HOT FILAMENT
CROOKES PROVES THAT "CATHODE RAYS" PROPAGATE IN A LINEAR FASHION
FIRST ATTEMPT TO CALCULATE THE MOTION OF CHARGED PARTICLES
PROOF THAT "CATHODE RAYS" CARRY NEGATIVE CHARGE
LORENTZ'S THEORY OF FORCE FROM MOTION OF CHARGED PARTICLES THROUGH A MAGNETIC FIELD
SOLENOID USED AS FOCUSING COIL FOR ELECTRONS
ELECTRONS VIEWED AS CURRENT CARRIERS RATHER THAN METALLIC IONS
CALCULATION OF ELECTRON MOTION IN A MAGNETIC DIPOLE FIELD
DEMONSTRATION THAT "CATHODE RAYS" IN VACUUM PRODUCE IMAGES OF OPTICAL QUALITY
MAGNETIC LENS WITH IRON CLADDING CONSTRUCTED
PATENT DISCLOSURE
KNOLL & RUSKA BUILD FIRST ELECTRON MICROSCOPE
ELECTRON MICROSCOPE WITH INTERNAL PHOTOGRAPHIC SYSTEM
CATHODE RAY TUBES PROPOSED FOR IMAGE TRANSMISSION
IMAGE STORAGE TUBE DEVELOPED
NONMISSION RESEARCH
MISSION-ORIENTED RESEARCH
DEVELOPMENT AND APPLICATION
PROJECTION X RAY MICROSCOPE
ELECTRON PROBE MICROANALYZER
SCANNING ELECTRON MICROSCOPE
CONVENTIONAL ELECTRON MICROSCOPE
HIGH VOLTAGE ELECTRON MICROSCOPE
SECONDARY EMISSION ELECTRON MICROSCOPE
1860
1870
1880
1890
1900
1910
1920
1930
1940

DEVELOPMENT OF THE ORAL CONTRACEPTIVE